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WOODWARD-CLYDE CONSULTANTS PLYMOUTH MEETING PA  
NATIONAL DAM INSPECTION PROGRAM SKYTOP DAM. NDS  
MAR 79

F/G 13/2  
I.D. NUMBER PA---ETC(U)  
DACW31-79-C-0017

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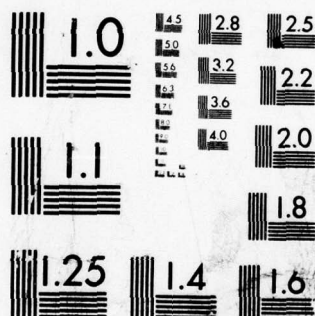
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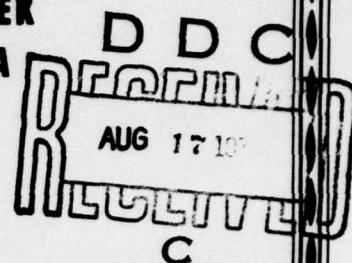
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MONROE COUNTY, PENNSYLVANIA

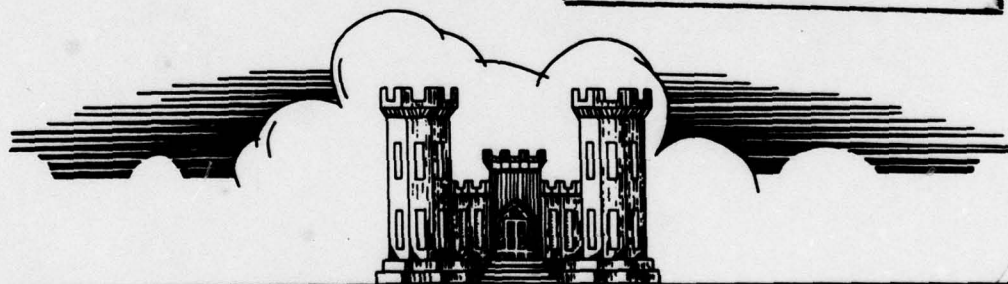
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DER ID 45-71



# SKYTOP DAM (MOUNTAIN LAKE)

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

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Contract # DAC W31-79-C-0017

DEPARTMENT OF THE ARMY  
Baltimore District, Corps of Engineers  
Baltimore, Maryland 21203

MARCH 1979

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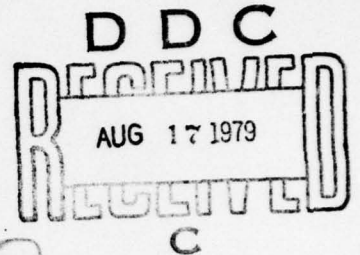
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DELAWARE RIVER BASIN

LEAVITT BRANCH; BRODHEAD CREEK  
MONROE COUNTY, PENNSYLVANIA

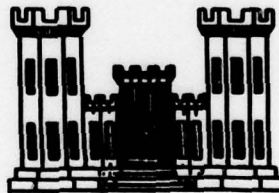
SKYTOP DAM

NDS I.D. NO. PA 00634  
DER I.D. NO. 45-71



6 PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

Skytop Dam. NDS I.D. Number PA-00634.  
DER I.D. Number 45-71. Delaware River  
Basin. Leavitt Branch; Brodhead Creek.  
Monroe County, Pennsylvania.  
Phase I Inspection Report.



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15 DACW 31-79-C-4417

Prepared by:

WOODWARD-CLYDE CONSULTANTS  
5120 Butler Pike  
Plymouth Meeting, Pennsylvania 19462

Submitted to:

DEPARTMENT OF THE ARMY  
Baltimore District, Corps of Engineers  
Baltimore, Maryland 21203

11 MARCH 1979

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## PREFACE

ACQUISITION FOR	NTIS G-1001	DDC TAB	Unannounced	Justification for	By	Distribution	Availability Codes	Available for	Dist	Special
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This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D. C., 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	Skytop Dam
County Located:	Monroe County
State Located:	Pennsylvania
Stream:	Leavitt Branch of Brodhead Creek
Coordinates:	Latitude 41° 13.7' Longitude 75° 14.1'
Date of Inspection:	18 October 1978

Skytop Dam is owned by Skytop Lodges, Inc., and is maintained by the Lodge. The dam serves as an access road to the lodge and the reservoir serves as a recreational facility for the guests. The dam was completed in 1930 and repaired in 1955 after the 13 August 1955 storm eroded portions of the embankment downstream of the core wall.

The dam and its appurtenant facilities are considered to be in relatively good condition and well maintained. The dam is classified as an "Intermediate" size structure with a "High" hazard classification. The "High" hazard classification is consistent with the potential to cause overtopping of the downstream dam, SCS PA 463, if failure coincided with an extreme event and, therefore, for extensive property damage and loss of life in Canadensis, Pennsylvania.

Calculations indicate that the existing spillway is not capable of passing 50 percent of the Probable Maximum Flood (PMF) without overtopping. Although the spillway does not pass 0.5 of the PMF without overtopping, the spillway is not rated as "Seriously Inadequate" because all three conditions necessary for a "Seriously Inadequate" classification are not met. Therefore, the spillway is considered to be "Inadequate".

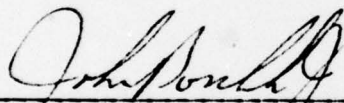
The visual inspection and review of available documentation disclosed no significant deficiencies in the design of the dam, foundation or its appurtenant structures. Other than gravel deposits in the approach channel of the spillway, minor seepage near the toe of the right abutment, and the inadequate size of the spillway, no other significant structural deficiencies were observed.

Considering the overall condition of the dam, the following recommendations are presented.

1. The stone on the upstream side of the spillway should be removed to improve hydraulic conditions through the spillway.
2. Seepage on the downstream slope adjacent to the right abutment should be collected and monitored for changes in rates and turbidity. Should either occur or the wet area enlarges, appropriate remedial measures should be taken.
3. Consideration should be given to enlarge the spillway to pass at least 0.5 PMF.

Because of the location and hazard classification of this structure, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. In the event that water behind SCS Dam PA 463 approaches the emergency spillway level, residents below SCS Dam 463 should be warned of impending high flows through the town of Canadensis.

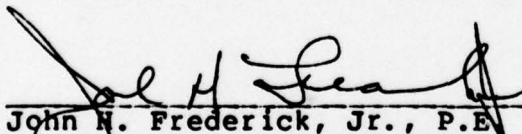
The Owner should develop an operation and maintenance procedure to be used to insure that the dam is operated in a safe manner and maintained in the best possible condition.



John Boschuk, Jr., P.E.  
Pennsylvania Registration 27450E  
Woodward-Clyde Consultants

5 March 79

Date

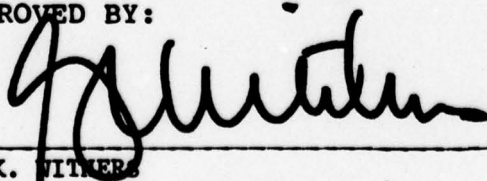


John N. Frederick, Jr., P.E.  
Maryland Registration 7301  
Woodward-Clyde Consultants

3/5/79

Date

APPROVED BY:

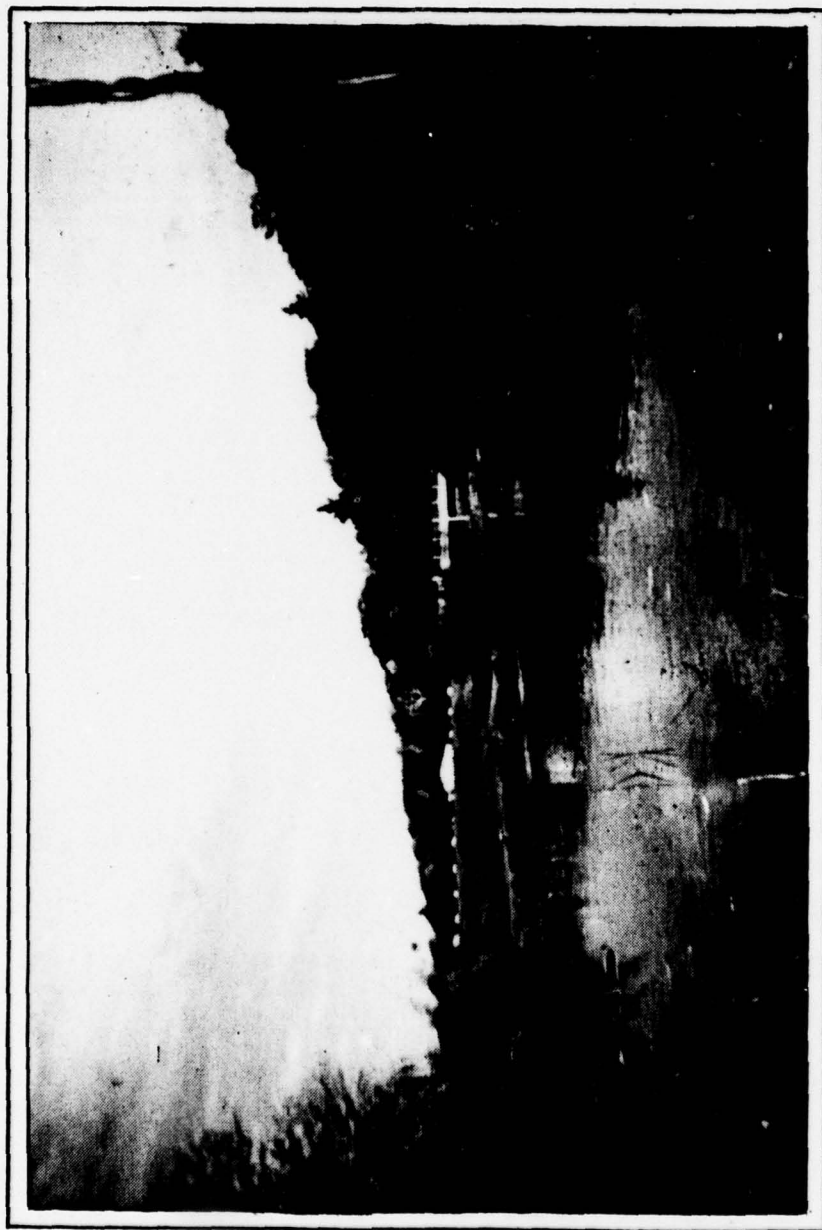


G. K. WINTERS  
Colonel, Corps of Engineers  
District Engineer

4 Apr 79

Date





OVERVIEW  
SKYTOP DAM, MONROE COUNTY, PENNSYLVANIA



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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM  
SKYTOP DAM  
NATIONAL ID #PA 00634  
DER #45-71

SECTION 1  
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Skytop Dam is a 19 foot high zoned embankment with an 18 foot high concrete core wall. The dam impounds a 68-acre reservoir. The embankment downstream of the core wall is composed of a porous gravelly material. The downstream slope is 2H:1V. Immediately upstream of the core wall is a triangular-shaped impervious zone. The remaining portion of the upstream zone is composed of a "dirty" gravel and protected with hand-placed riprap. The upstream slope is 2H:1V. The crest is 24 feet wide. ~~Typical embankment sections can be seen on Plate 3, Appendix E.~~

The structure has a gatehouse located at the upstream toe. ~~(see Plate 3).~~ The gatehouse tower contains a wooden sluice gate with a screened entrance, and a "Wilcox" gate valve inside the tower, which allows water to enter a 24-inch cast iron pipe. ~~(see Plate 4).~~ The 24-inch blow off pipe discharges at the downstream toe into the middle of the three lakes, Skytop Dam being the upper and largest of the three lakes on this property.

The crest elevation of the dam is 1,525 and the crest of the concrete core wall is 1,524. Elevations of the other structures could not be determined from available documentation. However, they were estimated from the drawings and are presented in Section 1.3 of this report.

The structure also contains a spillway located at the left abutment, as shown on Plate 3 and Photo 3. The main entrance to Skytop Lodge crosses the spillway and dam crest.

Water is normally discharged over the spillway which has a crest elevation of 1,520. This spillway controls the reservoir level. The gatehouse is only used to drain the reservoir as needed.

b. Location. The dam is located on the Leavitt Branch of Brodhead Creek in Barrett Township, Monroe County, Pennsylvania. The dam site is located approximately 2.6 miles north of Canadensis, Pennsylvania, west of Route 390. The dam site and reservoir are shown on USGS Quadrangle entitled "Skytop, Pennsylvania" at coordinates N 41° 13.7' W 75° 14.1'. A regional location plan of Skytop Dam and reservoir is enclosed as Plates 1 and 1A, Appendix E. As shown on these plates, there are three dams between Skytop Dam and the town of Canadensis. There are also two dams upstream of Skytop Dam known as Lake In The Clouds and Lake Jamie.

c. Size Classification. The dam is classified as "Intermediate" by virtue of its 1,021 acre-foot maximum storage capacity. This value was computed from field measurements taken during the inspection. It is slightly lower than the design storage capacity of 1,037 acre-feet found in DER files.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential to cause overtopping of downstream dam SCS PA 463 if failure coincided with an extreme event and, therefore, for extensive property damage and loss of life in Canadensis, Pennsylvania.

e. Ownership. Skytop Dam is owned and maintained by Skytop Lodges, Inc., in Skytop, Pennsylvania. All correspondence should be addressed to Mr. Donald Biles, General Manager, Skytop Lodges, Inc., Skytop, Pennsylvania 18357.

f. Purpose. The purpose of this dam is for recreation associated with Skytop Lodges.

g. Design and Construction History. The first dam in the vicinity of this site was constructed before 1919, and was located approximately 30 feet upstream of the present dam. In May 1919, the State inspected that dam owned by Mr. Lafayette Price, and considered the structure to be in very poor condition, requiring either to be breached or rebuilt. Mr. Price decided to replace the structure with a concrete and stone dam. However, in 1921, Mr. Price submitted an



application to construct an earth and rock fill dam. Subsequent to the State's review, the State recommended several modifications. Later that year, the resort ownership was transferred from Mr. Price to Mr. Frank W. Janney. In April 1922, the State inspected the dam reconstruction and noted that the downstream embankment was not being constructed at approximately the same rate as the upstream embankment. Therefore, the center core wall rotated downstream approximately two to four inches, and the upstream slope settled 18 to 24 inches. Between 1922 and 1926, reconstruction continued intermittently, though unsatisfactorily. In 1926, the ownership changed hands again, to the present owner, Skytop Lodges. In 1927, the dam was in poor condition; Skytop Lodges planned rebuilding the dam. By February 1928, plans and specifications were drawn for the present structure, located about 30 feet downstream of the original dam. Several of the State's recommendations were included in the final plans, shown in Appendix E. Reconstruction began in the summer of 1928. Between 1928 and early 1930, work was extremely slow and not always performed in a satisfactory manner. However, in the summer of 1930, progress improved substantially, and by late 1930, the dam was completed.

The dam was overtopped by flood waters on 13 August 1955, eroding significant portions of the downstream embankment. The core wall, which is founded two to three feet into hardpan, remained intact and the dam did not fail. Subsequently, the embankment was reconstructed to its present configuration, as shown in the photographs in Appendix D.

h. Normal Operating Procedures. Reservoir outflow is controlled by the spillway, which discharges water into a pond immediately below the dam. If necessary to lower the reservoir, the valve in the gatehouse is opened, discharging water through the 24-inch cast iron pipe at the base of the embankment. This pipe discharges into the middle pool below the pool's normal water surface elevation. There are no minimum discharge requirements for this structure.

### 1.3 Pertinent Data.

A summary of pertinent data for Skytop Dam is presented as follows.

- |    |                             |        |
|----|-----------------------------|--------|
| a. | Drainage Area (sq miles)    | 5.9    |
| b. | Discharge at Dam Site (cfs) |        |
|    | Maximum Known Flood at Site | >3,000 |
|    | At Underside of Bridge      |        |



	At Underside of Bridge (elev 1,523)	1,600
	At Top of Dam (elev 1,524.8)	3,055
c.	Elevation (feet above MSL)	
	Top of Dam	1,524.8
	Top of Core Wall	1,524.0
	Top of Gatehouse Platform	1,525.0
	Spillway Crest	1,520.0
	Pond Drain Invert	1,507.5
	Pond Drain Outlet Invert	Unknown
d.	Reservoir (miles)	
	Length at Normal Pool	0.6
	Fetch at Normal Pool	0.6
e.	Storage (acre-feet)	
	Normal Pool	629
	To Top of Dam	1,021
f.	Reservoir Surface (acres)	
	Normal Pool	68
g.	Dam Data	
	Type	Earth w/concrete core wall.
	Volume	22,000± cu yds
	Length	680 ft
	Maximum Height	19 ft
	Top Width	24 ft
	Side Slope	
	Upstream	2H:1V
	Downstream	2H:1V
	Cutoff	Core wall.
	Grout Curtain	None
h.	Spillway	
	Type	Broad crested con- crete weir spill- way with a two- pier bridge a- cross the struc- ture.
i.	Pond Drain	
	Location	Gatehouse at up- stream toe.
	Gates	Two sluice gates: one to enter tow- er; one to enter pipe.
	Discharge	24-inch C.I.P.

## SECTION 2 ENGINEERING DATA

### 2.1 Design.

a. Data Available. A summary of engineering data for Skytop Dam is presented in the checklist attached as Appendix A. Principal documents containing pertinent data used for this report included the "Report Upon the Application of Skytop Lodges, Incorporated", dated 14 February 1928, and "Progress Reports On the Construction of the Dam" by Skytop Lodges, Incorporated, dated 1928 through 1930. In addition, there were several sheets of drawings prepared by Skytop Lodges, Inc., concerning the construction of the present structure, dated 1927 and 1928. There were also miscellaneous letters, correspondence, memos, inspection reports and other data associated with this structure in DER files.

The available data was sufficient to evaluate the principal features of the dam and appurtenant structures in accordance with Phase I inspection criteria. Selected portions of the drawings are included in Appendix E of this report.

b. Design Features. The principal design features are illustrated on the plan, profile and cross-section plates of the embankment and appurtenant structures that are enclosed in Appendix E as Plates 2 through 5. These plates are reproduced from design drawings prepared by the Owner. A description of the design features is presented in Section 1.2 entitled "Description of Project".

### 2.2 Construction.

A description of the construction history is presented in Section 1.2. The contractor who built the present dam is unknown. The 1955 repair was performed by Julius Krummel. Skytop Lodges, Inc., supervised the construction and repair.

### 2.3 Operational Data.

There are no operational records maintained. There are no minimum flow requirements for the downstream channel. There are no water level or rainfall records maintained for this structure.

## 2.4 Evaluation.

a. Availability. All engineering data reproduced in this report and described herein and studied for this investigation were provided by DER and supplemented by the Owner's representative.

b. Adequacy. The data available for review from DER files, the Owner, and calculations presented in this report were considered sufficiently adequate to evaluate the dam and appurtenant structures.

c. Validity. There is no reason to question the validity of the available data.



## SECTION 3 VISUAL INSPECTION

### 3.1 Findings.

a. General. The observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B, and are summarized and evaluated as follows. In general, the dam and its appurtenant facilities are in reasonably good condition and well maintained. The Owner's maintenance staff periodically exercises the pond drain valve, clears the spillway of debris and maintains the embankment slopes.

b. Dam. During the visual inspection, there were no indications of distortion in alignment or grade that would be indicative of movement of the embankment or the foundation. A careful inspection of the downstream slope and adjacent downstream area disclosed a small marshy area on the downstream side of the embankment near the toe of the right abutment. It appears that this area has been in this condition for many years and is stable. All seepage was observed to be clear with no signs of turbidity or progressively increasing flows.

There were no signs of riprap distortion, movement or deterioration. The quality of the rock was assessed to be good.

There were no indications of surface cracks noted on the embankment crest or the embankment slopes. The asphalt paved crest was in good condition with no surficial signs of stress associated with embankment settlement or cracking. There were no signs of sloughing or erosion of the embankment slopes or other types of deterioration observed. As shown on Plate 3, the embankment was not constructed with a specific internal drainage system. However, it is noted that the downstream portion of the embankment is composed of a granular, more pervious material. Since the downstream Doctor Maine Dam has its reservoir against the toe of Skytop Dam, seepage through the embankment toe, other than that observed near the right abutment, could not be ascertained.

c. Appurtenant Structures. At the time of inspection, access to the gatehouse was not possible (see Photo 1). Therefore, the inside of the gatehouse, the buried 24-inch cast iron pipe, and the underwater pipe outlet were not inspected. The external portions of the gatehouse above the water level were inspected from the shoreline. There were no



signs of distress or deterioration observed from this vantage point. Since the gates were closed and could not be exercised, the serviceability of these gates could not be determined. However, the Owner's representative, Mr. Black, indicated that both gates in the tower are operable and that they are periodically opened at least once and normally twice per year.

The spillway was inspected and there were no signs of deterioration, significant concrete spalling, or other features to indicate that the spillway is in a state of distress. The approach channel is filled in to about one foot below the weir crest. It is noted that several loads of crushed stone appear to have been dumped off the reservoir side of the bridge. The top of these gravel piles is higher than the weir crest, creating an undesirable hydraulic condition. The discharge channel was inspected and found to be in good condition. Similarly, the bridge over the spillway was also assessed to be in good condition. The vertical distance between the weir crest and the underside of the bridge was limited to about 3 feet.

d. Reservoir. Reconnaissance of the reservoir disclosed no evidence of significant siltation, slope instability or other features that would significantly affect the flood storage capacity of the reservoir. The drainage area surrounding the reservoir was inspected and assessed to be quite stable and well vegetated with moderate slopes covered with grass or trees.

e. Downstream Channel. As shown on Plate 1, Appendix E, there are three dams owned by Skytop Lodges. Skytop Dam is the largest and the furthest upstream structure. Doctor Maine Dam located immediately below Skytop Dam is a very low structure (4 to 5 feet) containing very little water. The third structure, No. 10 Dam, is located approximately 2,250 feet below Skytop Dam and is a 30 foot high masonry dam which stores approximately 55 acre-feet of water. It is considered to be in relatively good condition. In the event that Skytop Dam fails, Doctor Maine Dam is unlikely to fail; however, No. 10 Dam may fail due to overtopping.

The foot bridge across No. 10 Dam is expected to be washed out. It is also noted that this structure has experienced some overtopping in 1955 without failure. However, the duration of overtopping and the height of water over the structure is unknown. Thereafter, water flows in a rock channel and discharges into a flood retention reservoir created by SCS Dam PA 463, located 1.3 miles downstream. Downstream of SCS Dam PA 463, water flows through the town of

Canadensis, which is the damage center for Skytop Dam. This town contains more than 100 homes, and many would be affected by flows through the Leavitt Branch of Brodhead Creek. This condition justifies the "High" hazard classification of Skytop Dam.

### 3.2 Evaluation.

Inspection of the dam disclosed no evidence of apparent past or present movement that would indicate existing instability of the structure or spillway. Although the pond drain sluice gate valves were not exercised during the inspection, representatives from Skytop Lodge indicated that these gates do function properly and are exercised at least once and normally two times per year. The spillway and bridge are considered to be in good condition. The seepage noted near the right abutment of the embankment was clear, assessed to be stable, and not a critical condition at this time.

## SECTION 4 OPERATIONAL PROCEDURES

### 4.1 Procedures.

Operational procedures are discussed in Section 1.2. Operation of the dam does not require a dam tender. Under normal conditions, all flow is discharged over the spillway at elevation 1,520. There are no formal written operation or maintenance procedures for this structure. Representatives of Skytop Lodges, Inc., indicate that the embankment slopes and appurtenant features are inspected and maintained on a regular basis by grounds maintenance personnel.

### 4.2 Maintenance of the Dam.

The dam is maintained by the Skytop Lodge, Inc., maintenance staff who periodically mow the grass, remove woody vegetation from the slopes, and perform minor cosmetic repairs to the embankment crest and slopes.

### 4.3 Maintenance of Operating Facilities.

The pond drain and spillway are maintained by the Skytop Lodges' grounds maintenance staff, who are on the site every day.

### 4.4 Warning Systems In Effect.

There are no formal warning systems or procedures established to be followed during periods of heavy rainfall.

### 4.5 Evaluation.

It is judged that the current operating procedure, which does not require a full-time dam tender, is a realistic means of operating the relatively simple control facility at Skytop Dam. The operating procedure to exercise the valves, and conditions upon which the reservoir is lowered, should be formalized and documented. In addition, a maintenance procedure and inspection checklist should be developed to insure that all items are periodically inspected and maintained in good condition.



Since there are no formal warning procedures, it is recommended that a formal procedure be developed so that the area below the dam can be cleared if high flows or potentially hazardous conditions develop.

#### 4.1 Evaluation of Features

a. Design/Construction Data. As discussed in Section 1.1 under "Design and Construction History", three dams have been built at or near this location. The existing spillway design was evaluated in a 1975 report dated 12 February 1975. Further hydrologic and hydraulic evaluations are contained in Appendix C.

The watershed is small, V-shaped, approximately 5.4 miles long and 4.1 miles wide, having a total area of 2.2 square miles. The forest watershed is approximately 4.5 miles. About 14 percent of the watershed is controlled by two upstream structures in series. The lower of the two dams, Lake in the Clouds, is about 4.1 river miles above Skayway Dam. Lake in the Clouds Dam, between 1.1 and 1.7 miles high, has a surface area of about 28 acres and controls a watershed of 1.2 square miles. Upstream of Lake in the Clouds is Lake Umbagog, which is 1.4 miles high and has a surface area of about 45 acres. Construction of this dam added about 0.7 square miles to the original drainage area. There are several significant storage areas greater than 100 acres located in the upper reaches of this watershed, which afford temporary storage. Storage reservoirs to the side of a previously existing lake. Watershed elevations range from approximately 1,400 feet to a normal pool elevation of 1,510 at the spillway crest. The watershed is more than 95 percent wooded with less than 10 percent residential development. It is likely that residential development will continue to some degree within the watershed.

The 1975 report evaluated the spillway capacity to be 1,850 cfs when the reservoir surface was 1 foot above the weir. At the time, there was a bridge about 1 foot high, which was located about 3 feet above the spillway. Therefore, the spillway capacity was evaluated as an orifice for water flowing up to five feet above the weir, the top of the dam. The report estimated the maximum discharge to be about 2,000 cfs with a reservoir surface at the top of the embankment.

In accordance with the criteria established by the Federal (FCC) Guidelines, the recommended spillway design flood for this "intermediate" size dam and "high" hazard potential classification is the probable maximum flood (PMF).



## SECTION 5 HYDROLOGY/HYDRAULICS

### 5.1 Evaluation of Features.

a. Design/Evaluation Data. As discussed in Section 1.2 under "Design and Construction History", three dams have been built at or near this location. The existing spillway design was evaluated in a State report dated 14 February 1928. Further hydrologic and hydraulic evaluations are contained in Appendix C.

The watershed is small, L-shaped, approximately 2.4 miles long and 4.2 miles wide, having a total area of 5.9 square miles. The longest watercourse is approximately 6.6 miles. About 34 percent of the watershed is controlled by two upstream structures in series. The lower of the two dams, Lake In the Clouds, is about 4.2 river miles above Skytop Dam. Lake In the Clouds Dam, DER #52-125, is 17 feet high, has a surface area of about 56 acres and controls a watershed of 1.75 square miles. Upstream of Lake In the Clouds is Lake Jamie, DER #45-220, which is 14 feet high and has a surface area of about 40 acres. Construction of this dam added about 0.7 square miles to the original drainage area. There are several significant swampy areas greater than 160 acres located in the upper reaches of this watershed, which afford temporary storage. Skytop reservoir is the site of a pre-existing lake. Watershed elevations range from approximately 2,400 feet to a normal pool elevation of 1,520 at the spillway crest. The watershed is more than 95 percent wooded with less than 10 percent residential development. It is likely that residential development will continue to some degree within the watershed.

The 1928 report evaluated the spillway capacity to be 1,850 cfs when the reservoir surface was 3 feet above the weir. At the time, there was a bridge about 3 feet high, which was located about 3 feet above the spillway. Therefore, the spillway capacity was evaluated as an orifice for water depths up to five feet above the weir, the top of the dam. The report estimated the maximum discharge to be about 2,900 cfs with a reservoir surface at the top of the embankment.

In accordance with the criteria established by the Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High" hazard potential classification is the Probable Maximum Flood (PMF).

b. Experience Data. No reservoir level records or rainfall records are maintained for this dam. The maximum water level reported occurred during Tropical Storm Diane, August 1955. The embankment was overtopped by about one foot for a reported 24 hours. During the overtopping, the earth fill downstream of the core wall washed away at several locations. However, the spillway, bridge abutments and the core wall were undamaged. Weather Service publications indicate consecutive one-day rainfalls of 2.11 and 9 inches in the general area.

c. Visual Observations. A condition observed at the time of the inspection that would indicate a reduced spillway capacity was that the upstream side of the spillway weir has been filled in, reducing the allowable coefficient of discharge and, therefore, the discharge capacity of the weir. As shown on Photograph No. 4, it appears that recently crushed stone/gravel has been dumped off the bridge. Field observations indicated that the top of the dam is 4.8 feet above the weir crest instead of the design value of 5 feet. The field measured value was used in the hydraulic analysis. Other observations regarding the condition of the downstream channel, spillway and reservoir are located in Appendix B.

d. Overtopping Potential. The overtopping potential of this dam was estimated using the "HEC-1, Dam Safety Version", computer program. A brief description of the program is included in Appendix C. Failure of the upstream dams have been conservatively neglected. If either of the structures were to fail, the highway embankments and upstream swampy areas would attenuate the discharge. The inflow hydrograph to Skytop Dam was determined by adding the outflow from Lake In The Clouds to the uncontrolled area hydrograph.

Calculations for this investigation essentially confirm the spillway evaluation, with an estimated discharge of 3,150 cfs with the reservoir at the design top of dam. The HEC-1 program computed the peak PMF inflow to be 9,838 cfs. As shown in Appendix C, the maximum reservoir water surface elevation for 0.5 PMF is 1,525.42 feet, or about 7 inches over the roadway. The 1,525.42 foot value is conservatively derived, as no allowance has been made for temporary flood storage by the 160-acre marshy areas located upstream of the structures, nor for flood storage afforded by Lake Jaime.

e. Spillway Adequacy. A spillway that will not pass 0.5 PMF without overtopping the dam is rated as "Seriously Inadequate" only if two other conditions are present. As this dam has withstood overtopping of at least one foot, the 0.5 PMF will not cause this dam to fail. Therefore, the spillway is rated as "Inadequate" but not "Seriously Inadequate".

f. Downstream Conditions. At the toe of Skytop Dam is a pool formed by a low concrete dam which is not subject to failure by overtopping. Dam No. 10, DER #45-103, is about 2,250 feet downstream of Skytop Dam. No. 10 Dam was not reported to have suffered damage during the storm of August 1955. About 1.3 miles downstream of No. 10 Dam is an 88 foot high flood control dam, SCS Dam PA 463, DER #45-250. Failure of No. 10 Dam during a PMF would have negligible effect on SCS Dam 463. However, failure of Skytop Dam during such an event would likely cause SCS Dam PA 463 to overtop, causing damage to residences in Canadensis, Pennsylvania. A detailed description of downstream conditions are discussed in Section 3.1, paragraph e. Damage including loss of life would be significantly greater if the dam failed during passing of the PMF than damage resulting from high flows occurring just before failure of the dam.



## SECTION 6 STRUCTURAL STABILITY

### 6.1 Evaluation of Structural Stability.

a. Visual Observations. The visual observations detected no evidence of existing embankment stability problems. The upstream riprap was stable and in quite good condition. Similarly, the vegetated slopes and the asphalt surface roadway across the crest were also assessed to be in good condition. There were no exterior signs or evidence indicating that internal seepage was occurring to an extent that would have a detrimental effect on the stability of the dam at this time. A small seepage zone was observed at the right abutment of the structure at the embankment toe. However, seepage emanating from this area was clear and the area was assessed to be quite stable. Since the middle reservoir is against the downstream toe of Skytop Dam, seepage at the base of the embankment could not be assessed.

The exposed portions of the gatehouse tower were inspected and observed to be in good condition. Although the pond drain valves were not exercised, the Owner's representative indicated that both valves operate properly, and that they are exercised at least once and usually twice per year. The spillway was assessed to be in good condition.

b. Design and Construction Data. Design documentation was extremely limited, and data was obtained principally from the available drawings and from the "Report Upon the Application". There were several letters in the files of the Department of Environmental Resources (DER) documenting such changes as deepening of the concrete cutoff wall, the use of impermeable material on the upstream side of the cutoff wall, and several other minor modifications to the structure. Stability analysis and other structural calculations for the embankment could not be found in DER files or the files of Skytop Lodges, Inc. The results of a stability analysis performed on the spillway were found and are presented on Plate 5, Appendix E.

Since the embankment stability calculations are not available, the stability evaluation was based on an assessment of the geometric configuration of the embankment and an assessment of the engineering properties of the materials native to this area. This assessment indicates that the cross-section presented on Plate 3, Appendix E, appears reasonable.

c. Operating Records. There are no operational records for this structure.

d. Post-Construction Changes. Other than the replacement of the downstream materials subsequent to the storm of 1955, there were no modifications or post-construction changes performed to this dam.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. Since the results of the static stability analysis were not available, an assessment of the seismic stability of the dam is also unknown.

## SECTION 7 ASSESSMENT/REMEDIAL MEASURES

### 7.1 Dam Assessment.

a. Evaluation. The visual inspection and review of the limited design and construction documentation indicate that the dam, foundation and appurtenant structures of Skytop Dam are in good condition. It is noted that the pool level at the time of inspection was just below the level of the spillway, allowing for a thorough inspection of the weir and discharge channel.

The hydrologic and hydraulic computations presented in Appendix C indicate that the dam will not pass 50 percent of the Probable Maximum Flood without overtopping. However, since the embankment has experienced overtopping without catastrophic failure, the spillway is considered "Inadequate" and not "Seriously Inadequate".

In the event of failure or overtopping, property damage between Skytop Dam and SCS Dam 463 would be limited to buildings owned by Skytop Lodges. Failure of Skytop reservoir would be contained by downstream SCS Dam PA 463 if the reservoir level of SCS Dam PA 463 is not at or near the design maximum level. Thus, significant damage to the town of Canadensis would not be expected. However, if Skytop Dam failed while SCS Dam PA 463 is at its maximum pool, it is possible that SCS Dam PA 463 would overtop causing damage to Canadensis, thus justifying the "High" hazard classification.

b. Adequacy of Information. The limited information available for this investigation was sufficiently adequate to evaluate the structure.

c. Urgency. It is recommended that the suggestions presented in Section 7.2 be implemented as soon as practical.

### 7.2 Remedial Measures.

a. Facilities. It is recommended that the following measures be undertaken.

1. The stone on the upstream side of the spillway should be removed to improve hydraulic conditions through the spillway.



2. The seepage on the downstream slope adjacent to the right abutment should be collected and monitored for changes in rates or turbidity. Should either occur or the wet area enlarges, appropriate remedial measures should be taken.
3. Consideration should be given to increasing the spillway to pass at least 50 percent of the PMF without overtopping.

b. Operation and Maintenance Procedures. Because of the location and hazard classification of the dam, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of evacuating occupants of the structures along the creek between the dam and SCS Dam PA 463. In the event that water behind SCS Dam PA 463 approaches the emergency spillway level, residents below SCS Dam 463 should be warned of impending high flows through the town of Canadensis.

The Owner should develop an operation and maintenance procedure to be used to insure that the dam is operated in a safe manner and maintained in the best condition possible.

**APPENDIX**

**A**

CHECK LIST  
ENGINEERING DATA  
DESIGN, CONSTRUCTION, OPERATION  
PHASE I

NAME OF DAM Skytop Dam  
ID # PA 00634

Sheet 1 of 4

REMARKS

ITEM

AS-BUILT DRAWINGS

No. There are 1925-1927 blueprints showing the design of the structure. See available drawings in Appendix E.

REGIONAL VICINITY MAP

See Appendix E, Plate 1.

CONSTRUCTION HISTORY

Yes. DER files contain several progress reports describing the construction of the dam in 1930.

TYPICAL SECTIONS OF DAM

Yes. See Appendix E.

OUTLETS - PLAN

DETAILS

See Appendix E.

CONSTRAINTS

DISCHARGE RATINGS

Data not available.

RAINFALL/RESERVOIR RECORDS

Records are not maintained.



ITEM	REMARKS
DESIGN REPORTS	None
GEOLOGY REPORTS	None. See Appendix F for geologic data.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Data and information are not available.
POST-CONSTRUCTION SURVEYS OF DAM	None. Dam was overtopped in 1955 and rebuilt. Reconstruction documentation is not available.
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Unknown
HIGH POOL RECORDS	None
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	In 1955 the dam was overtopped and the downstream section washed out to the core wall. Reconstruction records are not available. See text for more information.
MAINTENANCE OPERATION RECORDS	None

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	See Appendix E.
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	See Appendix E.
	<ol style="list-style-type: none"> <li>1. Latest Inspection Report 1965 by DER.</li> <li>2. Specifications for reconstruction dated 2/7/28.</li> <li>3. "Report Upon the Application of Skytop Lodges, Inc." dated February 14, 1928 by George S. Beal.</li> <li>4. Miscellaneous progress reports of dam construction in the early 1920's. (Structure previous to current structure)</li> <li>5. "Application Report" dated 29 December 1927 to raise height of dam.</li> <li>6. 31 photographs of dam (1920-1930).</li> </ol>



**APPENDIX**

**B**

CHECK LIST  
VISUAL INSPECTION  
PHASE I

Sheet 1 of 11

Name Dam Skytop Dam County Monroe State Pennsylvania National ID # PA 00634  
Type of Dam Earth Hazard Category I (High)  
Date(s) Inspection 18 Oct. 1978 Weather Cloudy, Cool Temperature 40's

Pool Elevation at Time of Inspection 1519.2 M.S.L. Tailwater at Time of Inspection ~1510 M.S.L.

Inspection Personnel:

Mary Beck (Hydrologist) 23 October 1978  
John Boschuk, Jr. Civil John H. Frederick (Geotechnical)  
Raymond Lambert (Geologist)

John Boschuk, Jr. Recorder

Remarks:

Mr. John S. Black, Engineer/Purchasing Agent for the Skytop Corporation was available  
and provided assistance.

# CONCRETE/MASONRY DAMS

Sheet 2 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

ANY NOTICEABLE SEEPAGE	N/A	
------------------------	-----	--

STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
--	-----	--

DRAINS	N/A	
--------	-----	--

WATER PASSAGES	N/A	
----------------	-----	--

FOUNDATION	N/A	
------------	-----	--



# CONCRETE/MASONRY DAMS

Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

2004 9 04 11

EMBANKMENT

Sheet 4 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

SURFACE CRACKS	None observed.	Asphalt roadway across crest of dam.
----------------	----------------	--------------------------------------

UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
---	----------------	--

SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	No significant sloughing, erosion or other types of deterioration observed.	
--	---	--

VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The vertical and horizontal alignment appears to be satisfactory with no unusual undulations, distortions or settlement observed.	
---	---	--

RIPRAP FAILURES	None observed.	
-----------------	----------------	--

EMBANKMENT

Sheet 5 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

**JUNCTION OF EMBANKMENT  
AND ABUTMENT, SPILLWAY  
AND DAM**

*The junctions appeared to be in satisfactory condition.*

**ANY NOTICEABLE SEEPAGE**

*Yes. A marshy zone was noted on the downstream side of the embankment near the toe of the right abutment. It appears that the area has been in this condition for many years and is stable. No action is recommended.*

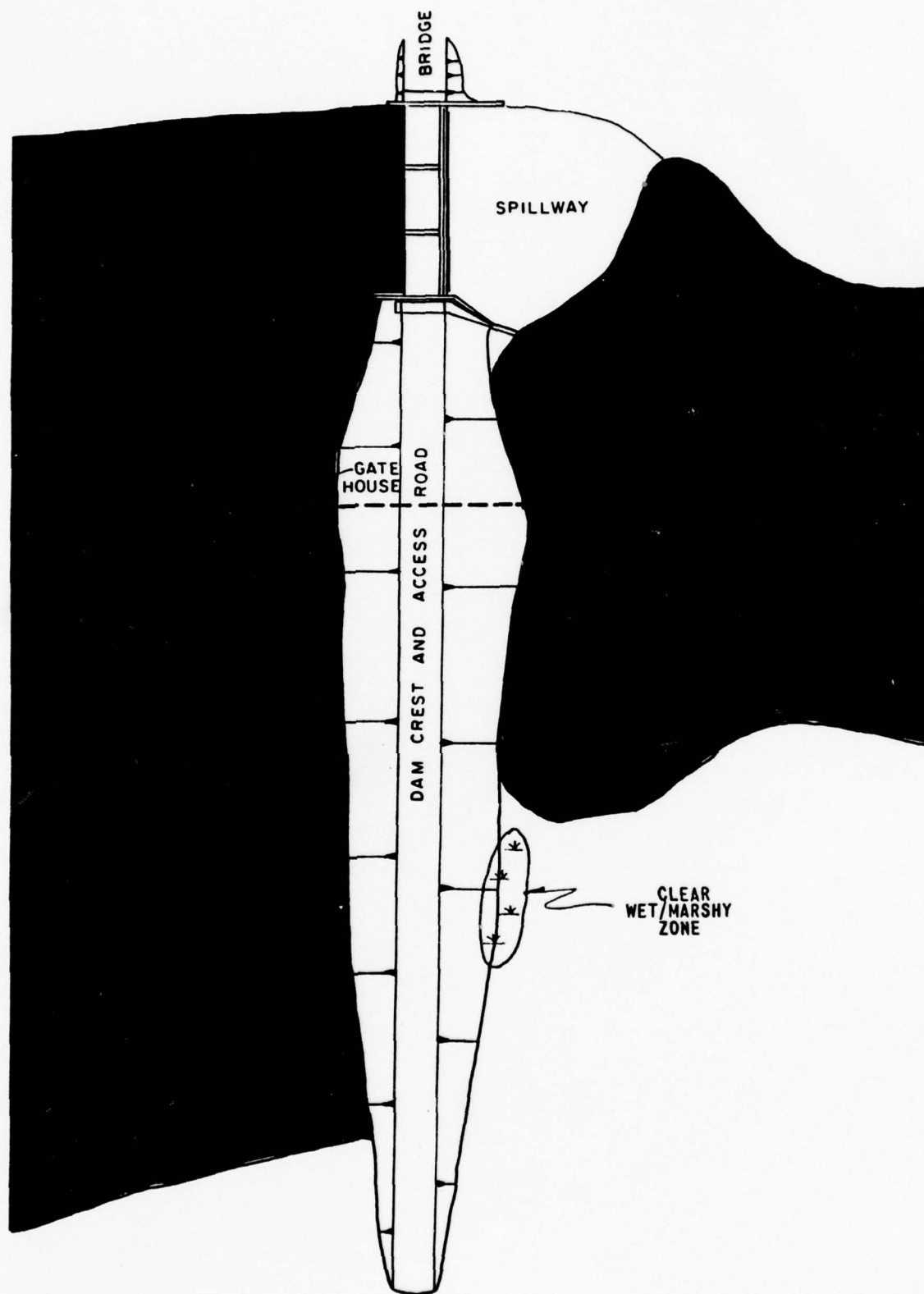
**STAFF GAGE AND RECORDER**

*None*

**DRAINS**

*None*





SEEPAGE LOCATION PLAN  
SHEET 5A OF 11

OUTLET WORKS

Sheet 6 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The outlet system could not be inspected in that it is located within the embankment and discharges below the water level of the lower reservoir.	
INTAKE STRUCTURE	The external portions of the structure above the pool were inspected and observed to be in good condition. The portion below the pool and interior of the tower could not be inspected.	
OUTLET STRUCTURE	The system could not be inspected since it is under water.	
OUTLET CHANNEL	None	
EMERGENCY GATE	No gates were exercised but the owner's representative (Mr. Black) stated that both gates in the tower are operable.	

UNGATED SPILLWAY

Sheet 7 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	<i>The crest was inspected and found to be in good condition.</i>	
APPROACH CHANNEL	<i>The approach channel has been filled in to about one foot below the weir, either by sediment or on purpose. Several loads of crushed stone appear to have been dumped off the reservoir side of the bridge. The top of the gravel piles are higher than the weir crest creating an undesirable hydraulic condition.</i>	
DISCHARGE CHANNEL	<i>The discharge channel was inspected and found to be in good condition.</i>	
BRIDGE AND PIERS	<i>The bridge over the spillway is in good condition. The vertical distance between the weir crest and the underside of the bridge is limited to about 3'2".</i>	



GATED SPILLWAY

Sheet 8 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	None	
APPROACH CHANNEL	None	
DISCHARGE CHANNEL	None	
BRIDGE AND PIERS	None	
GATES AND OPERATION EQUIPMENT	None	

INSTRUMENTATION

Sheet 9 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION

MONUMENTATION/SURVEYS

None

OBSERVATION WELLS

None

WEIRS

None

PIEZOMETERS

None

OTHER

None

RESERVOIR

Sheet 10 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SLOPES

*The reservoir side slopes are moderate and well vegetated with grass or trees.*

SEDIMENTATION

*Could not be determined.*



DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Skytop Dam discharges directly into a lower pond created by a four foot $\pm$ dam. The channel passes through a wooded flood plain for about 900 feet before entering a lower reservoir. The channel is in good condition, with the exception of brush growing in the channel immediately below the four foot dam, and is stable.	
SLOPES	Discharge from Skytop Dam flows through two reservoirs and over Leavitt Falls (about 70 feet high) before entering a channel having a gradient of 0.024.	
APPROXIMATE NO. OF HOMES AND POPULATION	There are three buildings belonging to Skytop Lodge, Inc. adjacent to the channel above the lower dam and reservoir. There are no homes or buildings below this lower dam and the downstream flood control structure, SCS PA 463. The population areas are below the flood control structure near Canadensis, Pennsylvania, downstream of SCS PA 463.	

**APPENDIX**

**C**

CHECK LIST  
HYDROLOGIC AND HYDRAULIC  
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 95+% wooded, 2 upstream structures and several swamp/marshy areas and ponds, little residential development.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1520.0 feet (629 Acre-Feet).

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): \*1524.8 feet (1021 Acre-Feet).

ELEVATION MAXIMUM DESIGN POOL: --

ELEVATION TOP DAM: 1525.0 feet.

## SPILLWAY

- a. Elevation 1520.0 feet.
- b. Type Concrete weir.
- c. Width ----
- d. Length 3-33'4"
- e. Location Spillover Adjacent to left abutment.
- f. Number and Type of Gates None.

## OUTLET WORKS:

- a. Type gate-house
- b. Location In reservoir.
- c. Entrance inverts 1509.5
- d. Exit inverts Unknown.
- e. Emergency draindown facilities 24 inch blow off

## HYDROMETEOROLOGICAL GAGES:

- a. Type None
- b. Location N/A
- c. Records N/A

MAXIMUM NON-DAMAGING DISCHARGE: -----

\*Based on field measurements.



DAM SAFETY ANALYSIS  
HYDROLOGIC/HYDRAULIC DATA

Date: 1/12/79  
By: MEB  
Sheet: 2 of 13

DAM Skytop Dam Nat. ID No. PA 00634 DER No. 45-71

ITEM/UNITS	Permit/Design Files (A)	Calc. from Files/Other (B)	Calc. from Observations (C)
1. Min. Crest Elev., ft.	<u>1525.0</u>		<u>1524.8</u>
2. Freeboard, ft.			
3. Spillway <sup>(1)</sup> Crest Elev, ft.	<u>1520.0</u>		
3a. Secondary <sup>(2)</sup> Crest Elev, ft.			
4. Max. Pool Elev., ft.			
5. Max. Outflow <sup>(3)</sup> , cfs	<u>2900</u>		
6. Drainage Area, mi <sup>2</sup>	<u>5.0</u>		<u>5.9</u>
7. Max. Inflow <sup>(4)</sup> , cfs			<u>9642</u>
8. Reservoir Surf. Area, Acre	<u>88</u>		<u>68</u>
9. Flood Storage <sup>(5)</sup> , Ac-Ft			

Reference all figures by number or calculation on attached sheets:

Example: 3A - Drawing No. xxx by J. Doe, Engr., in State File No. yyyy.

NOTES:

- (1) Main emergency spillway.
- (2) Secondary ungated spillway.
- (3) At maximum pool, with freeboard, ungated spillways only.
- (4) For columns B, C, use PMF.
- (5) Between lowest ungated spillway and maximum pool.

Date: 1/23/79  
By: MEB  
Sheet: 3 of 13

HYDROLOGIC/HYDRAULIC CALCULATIONS (cont.)

Item (from Sheet 2)	Source
1A, 3A	Drawing dated 3/25/27, Rev. 1/31/28
5A, 6A	"Application Report" dated Feb. 14, 1928
8A	Drawing dated 3/25/26
7A	See sheet 12
6A, 8A	USGS Maps Skytop, PA (1973) Buck Hill Falls, PA (1973)
1C	Based on field measurements

HEC-1, REVISED  
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspection Program. The "Flood Hydrograph Package (HEC-1), Dam Safety Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quadrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are inputted and flows are routed downstream to the damage center and a dam breach analysis is performed.

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out tables.



BY MFB DATE 1/23/79 SUBJECT Skytop Dam SHEET 5 OF 13  
 CHKD. BY [Signature] DATE 2/1/79 Hydrology / Hydraulics JOB No. \_\_\_\_\_

### Classification (Ref. Recommended Guidelines for Safety Inspection of Dams)

1. The hazard potential is rated as "High" as failure could precipitate failure of downstream dam, resulting in loss of life.
2. The size classification is "Intermediate" based on its reported total storage capacity of 1021 Ac-Ft.
3. The spillway design flood, based on size and hazard classification, is the Probable Maximum Flood (PMF).

### Hydrology and Hydraulic Analysis

1. Original design data - limited to statements in the 14 Feb. 1928 "Application Report" by the State evaluating the proposed spillway. The following information was given:

$L = 3 - 33'4"$  weirs  
 $H = 3'$ ,  $Q = 1850$  cfs - weir flow  
 $H = 4'$ ,  $Q = 2240$  cfs } orifice flow  
 $H = 5'$ ,  $Q = 2900$  cfs }

There was no further hydrologic/hydraulic design.

2. Evaluation of present structure was by use of the computer program. Computer input data as follows:

#### Inflow hydrographs

rainfall - ref. Hydrometeorological Report No. 93

Snyder's hydrograph parameters,  $t_p \neq C_p$

$$t_p = C_t (L + C_a)^{0.3}$$

$C_t = 1.23$  Information received

$C_p = 0.45$  from Corps of Engineer, Baltimore for Zone 1.

Lake in the Clouds Upper Skytop (subarea)

$L =$	2.46 miles	4.72 miles	} from USGS maps
$L_{ca} =$	1.13 miles	2.59 miles	
$t_p =$	1.68	2.61	

Drainage area, as determined from current USGS Maps is 5.9 sq miles, greater than the reported

BY MEB DATE 1/23/79SUBJECT Skytop DamSHEET 6 OF 13CHKD. BY [Signature] DATE 3/12/79Hydrology / Hydraulics

JOB No. \_\_\_\_\_

5.0 sq. miles. Construction of the upstream Lake Jamie Dam added about 0.7 sq. miles to the drainage area. The remaining difference may be attributed to use of the older 15 min. USGS Maps.

Reservoir routing  
elevation-storage

Lake in the Clouds - taken from USGS maps, shown on sheet 9

Upper Skytop Dam

normal storage = 629 Ac-Ft, taken from a 1926 drawing

Flood storage - taken from USGS map shown on sheet 11

elevation-discharge data

Lake in the Clouds -

$$Q = CLH^{3/2}$$

$C = 3.1$  assumed

$L = 32 H$  } field checked

$H = 5 \text{ ft.}$  }

Upper Skytop Dam - shown on sheet 11

$$Q = CLH^{3/2} \text{ assuming constant } C \text{ and } H = 3 \text{ ft.}$$

$L = 3 \cdot 33'4" = 100 \text{ ft.}$  field checked

$C = 3.1$  somewhat lower than normal for spillway cross section because of filled in approach, see Photo 4

$$Q = CA\sqrt{2gH} \text{ when weir \& bridge act as orifice}$$

$C = 0.7$  ref. National Engineering Handbook, Section 4

$A = 300 H^2$  field checked

Overtopping Potential - as shown on sheet 13, the spillway does not discharge 0.5 PMF.

Spillway adequacy - the spillway is rated as "Inadequate" but not "Seriously Inadequate". The dam is judged not to fail when overtopped by 0.5 PMF and, therefore, all conditions required to rate a spillway "Seriously Inadequate" are not present. Ref. ETL 1110-2-234, 10 May 1970, OGE. It is noted that the dam has been overtopped by about one foot previously (Aug. 1955)

MFB  
y/y

2/5/79  
2/12/79

Skytop Dam  
Hydrology / Hydraulics

SN. 7 OF 13

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT LIIC (Lake in the Clouds)  
ROUTE HYDROGRAPH TO LIIC  
RUNOFF HYDROGRAPH AT KY (Upper Skytop Dam)  
COMBINE 2 HYDROGRAPHS AT COM  
ROUTE HYDROGRAPH TO OSK (Outflow from Upper Skytop)  
END OF NETWORK

1\*\*\*\*\*  
FLOOD HYDROGRAPH PACKAGE (HEC-1)  
DAM SAFETY VERSION JULY 1978  
LAST MODIFICATION 21 AUG 78  
\*\*\*\*\*

RUN DATE\* 79/02/05.  
TIME\* 12.00.11.

UPPER SKYTOP DAM  
NAT ID NO. PA 00634 DER NO. 45-71  
OVERTOPPING ANALYSIS

JOB SPECIFICATION									
NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	15	0	0	0	0	0	4	0
			JOPER	NUT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED

RTIOS= .40 .50 .70 1.00  
NPLAN= 1 NRTIO= 4 LRTIO= 1



MFB  
CDB

2/5/79  
2/15/79

Skytop Dam  
Hydrology / Hydraulics

SH. 8 OF 13

SUB-AREA RUNOFF COMPUTATION

LAKE IN THE CLOUDS INFLOW HYDROGRAPH

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LITC	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

INHYD	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.75	0.00	5.90	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.70	111.00	124.00	134.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 1.68 CP= .45 NTA= 0

RECESSION DATA

STRTQ= -1.50 GRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 62 END-OF-PERIOD ORDINATES, LAG= 1.68 HOURS, CP= .45 VOL= 1.00

15.	57.	115.	182.	243.	285.	303.	292.	266.	243.
221.	202.	184.	168.	153.	140.	127.	116.	106.	97.
88.	80.	73.	67.	61.	55.	51.	46.	42.	38.
35.	32.	29.	27.	24.	22.	20.	18.	17.	15.
14.	13.	12.	11.	10.	9.	8.	7.	7.	6.
6.	5.	4.	4.	4.	3.	3.	3.	3.	2.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
-------	-------	--------	------	------	------	--------	-------	-------	--------	------	------	------	--------

SUN 24.65 22.28 2.37 93775.  
( 626. )( 566. )( 60. )( 2655.41 )

MFB  
4/9

2/5/79  
2/13/79

# Skytop Dam Hydrology / Hydraulics

SH. 9 OF 13

## HYDROGRAPH ROUTING

### OUTFLOW FROM LAKE IN THE CLOUDS

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LITC	1	0	0	0	0	1	0	0

### ROUTING DATA

QLOSS	CLOSS	AVG	IRCS	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTD	LAG	ANSKK	X	TSK	STORA	ISPRAT
0	0	0	0.000	0.000	0.000	-1830.	0

CAPACITY= 0. 1230.

ELEVATION= 1830. 1840.

CREL	SPWID	COBW	EXPW	ELEV	COQL	CAREA	EXPL
1830.0	32.0	3.1	1.5	0.0	0.0	0.0	0.0

### DAM DATA

TOPEL	COOD	EXPD	DAMWID
1835.0	2.5	1.5	340.

PEAK OUTFLOW IS 683. AT TIME 44.75 HOURS

PEAK OUTFLOW IS 902. AT TIME 44.50 HOURS

PEAK OUTFLOW IS 1621. AT TIME 43.75 HOURS

PEAK OUTFLOW IS 3006. AT TIME 43.00 HOURS

MFB 2/5/79  
JMA 4/13/79

Skytop Dam  
Hydrology / Hydraulics

SH. 10 OF 13

SUB-AREA KUNDOFF COMPUTATION

INFLOW TO SKYTOP

ISTAG	IECON	ITAPE	JPLT	JFRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	1	0	0

HYDROGRAPH DATA

INHYD	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	4.15	0.00	5.90	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.70	111.00	124.00	134.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STKR	DLTKR	RIIOL	ERAIN	STRS	RIIDK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 2.61 CP= .45 NTA= 0

RECESSION DATA

STRTO= -1.50 ORCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 94 END-OF-PERIOD ORDINATES, LAG= 2.62 HOURS, CP= .45 VOL= 1.00									
12.	46.	94.	151.	215.	283.	347.	400.	439.	465.
473.	58.	431.	405.	382.	359.	338.	318.	299.	282.
285.	250.	235.	221.	208.	196.	184.	174.	163.	154.
145.	136.	128.	121.	114.	107.	101.	95.	89.	84.
79.	74.	70.	66.	62.	58.	55.	52.	49.	46.
43.	41.	38.	36.	34.	32.	30.	28.	27.	25.
23.	22.	21.	20.	18.	17.	16.	15.	14.	14.
13.	12.	11.	11.	10.	9.	9.	8.	8.	7.
7.	7.	6.	6.	5.	5.	5.	5.	4.	4.
4.	4.	3.	3.						

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
0													
SUM 24.65 22.28 2.37 197421.													
( 626. )( 566. )( 60. )( 5590.34 )													



MFB  
9/9

2/5/79  
2/12/79

# Skytop Dam Hydrology / Hydraulics

SH. 11 of 13

## HYDROGRAPH ROUTING

OUTFLOW HYDROGRAPH FROM SKYTOP DAM									
ISTAB	ICOMP	OSK	IECON	IIAPE	JPLT	JFRT	INAME	ISTAGE	IAUTO
0.0	0.000	1	0	0	0	0	1	0	0
ROUTING DATA									
QLOSS	CLOSS	AVG	IRCS	ISAME	IOPT	IPMP	LSTR		
0.0	0.000	0.00	1	1	0	0	0		
NSTPS NSTDL									
1	0	0	0.000	0.000	X	TSK	STORA	ISPRAT	
			LAG	AMSKK		0.000	-1520.	-1	
STAGE	1520.0	1521.0	1522.0	1523.0	1524.0	1525.0	1528.0	1533.0	
FLOW	0.	310.	877.	1610.	2665.	3153.	4296.	5715.	
CAPACITY=	0.	629.	1037.	2659.					
ELEVATION=	1506.	1520.	1525.	1540.					
DAM DATA									
TOPEL	COORD	EXPW	ELEV	COBL	CAREA	EXPL			
1524.8	2.5	1.5	500.						

PEAK OUTFLOW IS 2966. AT TIME 44.00 HOURS

PEAK OUTFLOW IS 3916. AT TIME 43.75 HOURS

PEAK OUTFLOW IS 5992. AT TIME 43.50 HOURS

PEAK OUTFLOW IS 9642. AT TIME 43.25 HOURS

MFB  
99

2/5/79  
2/12/79

Skytop Dam  
Hydrology / Hydraulics

SH. 12 OF 13

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)  
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS			
				RATIO 1	RATIO 2	RATIO 3	RATIO 4
				.40	.50	.70	1.00
HYDROGRAPH AT	LITC	1.75 ( 4.53)	1	1497. ( 42.39)	1871. ( 52.99)	2620. ( 74.18)	3743. ( 105.98)
	LITC	1.75 ( 4.53)	1	683. ( 19.33)	902. ( 25.54)	1621. ( 45.90)	3006. ( 85.13)
HYDROGRAPH AT	KY	4.15 ( 10.75)	1	2789. ( 78.97)	3486. ( 98.71)	4880. ( 138.19)	6972. ( 197.41)
	COM	5.90 ( 15.28)	1	3314. ( 93.84)	4195. ( 118.79)	6115. ( 173.16)	9838. ( 278.58)
ROUTED TO	OSK	5.90 ( 15.28)	1	2966. ( 83.98)	3916. ( 110.88)	5992. ( 169.66)	9642. ( 273.03)

MFB  
JY

2/5/79  
2/12/79

Skytop Dam  
Hydrology / Hydraulics

SH. 13 OF 13

SUMMARY OF DAM SAFETY ANALYSIS

*Lake in the Clouds*

ELEVATION	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
STORAGE	1830.00	1830.00	1835.00
OUTFLOW	0.	0.	615.
	0.	0.	1109.

RATIO OF PMF	MAXIMUM RESERVOIR U.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.40	1833.62	0.00	445.	683.	0.00	44.75	0.00
.50	1834.36	0.00	536.	902.	0.00	44.50	0.00
.70	1835.53	.53	680.	1621.	4.00	43.75	0.00
1.00	1836.40	1.40	787.	3006.	6.50	43.00	0.00

SUMMARY OF DAM SAFETY ANALYSIS

*Skytop Dam*

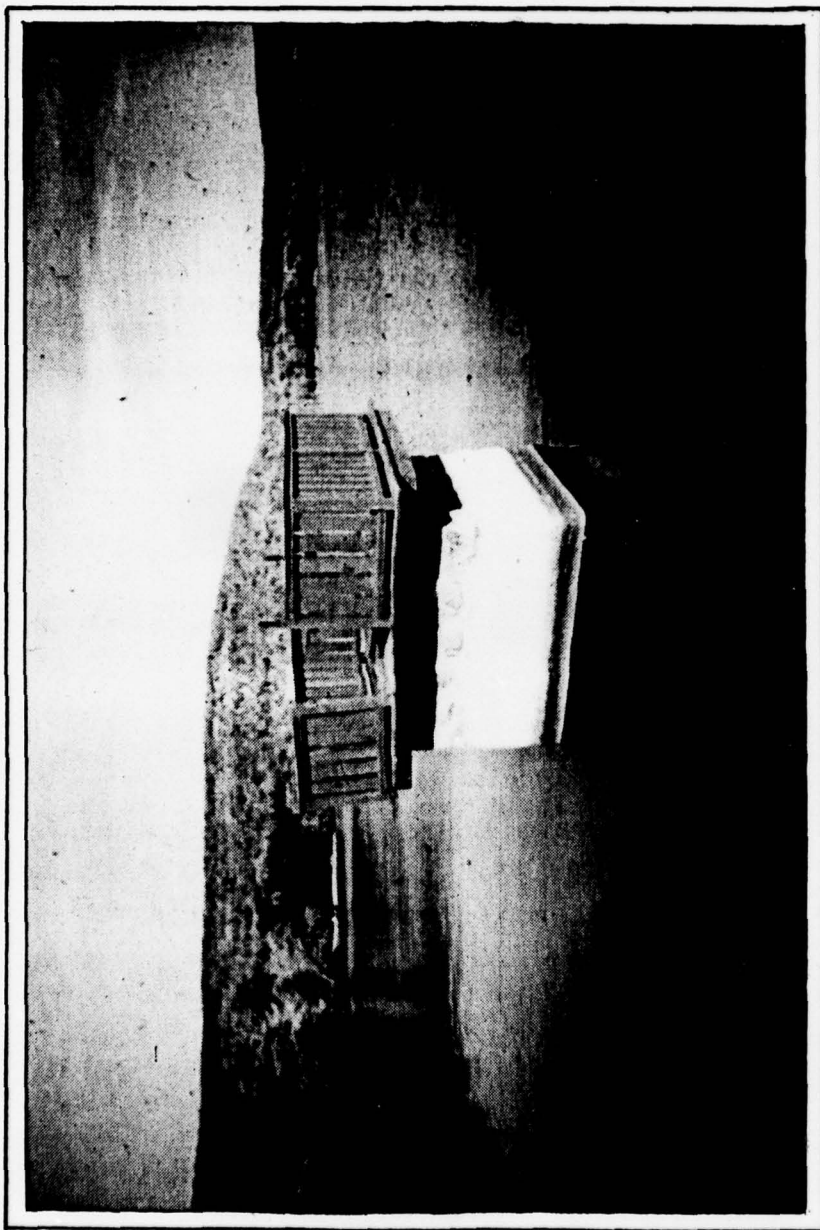
ELEVATION	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
STORAGE	1520.00	1520.00	1524.80
OUTFLOW	629.	629.	1021.
	0.	0.	3055.

RATIO OF PMF	MAXIMUM RESERVOIR U.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.40	1524.62	0.00	1006.	2966.	0.00	44.00	0.00
.50	1525.42	.62	1082.	3916.	4.00	43.75	0.00
.70	1526.32	1.52	1179.	5992.	6.75	43.50	0.00
1.00	1527.50	2.70	1307.	9642.	7.75	43.25	0.00



**APPENDIX**

**D**



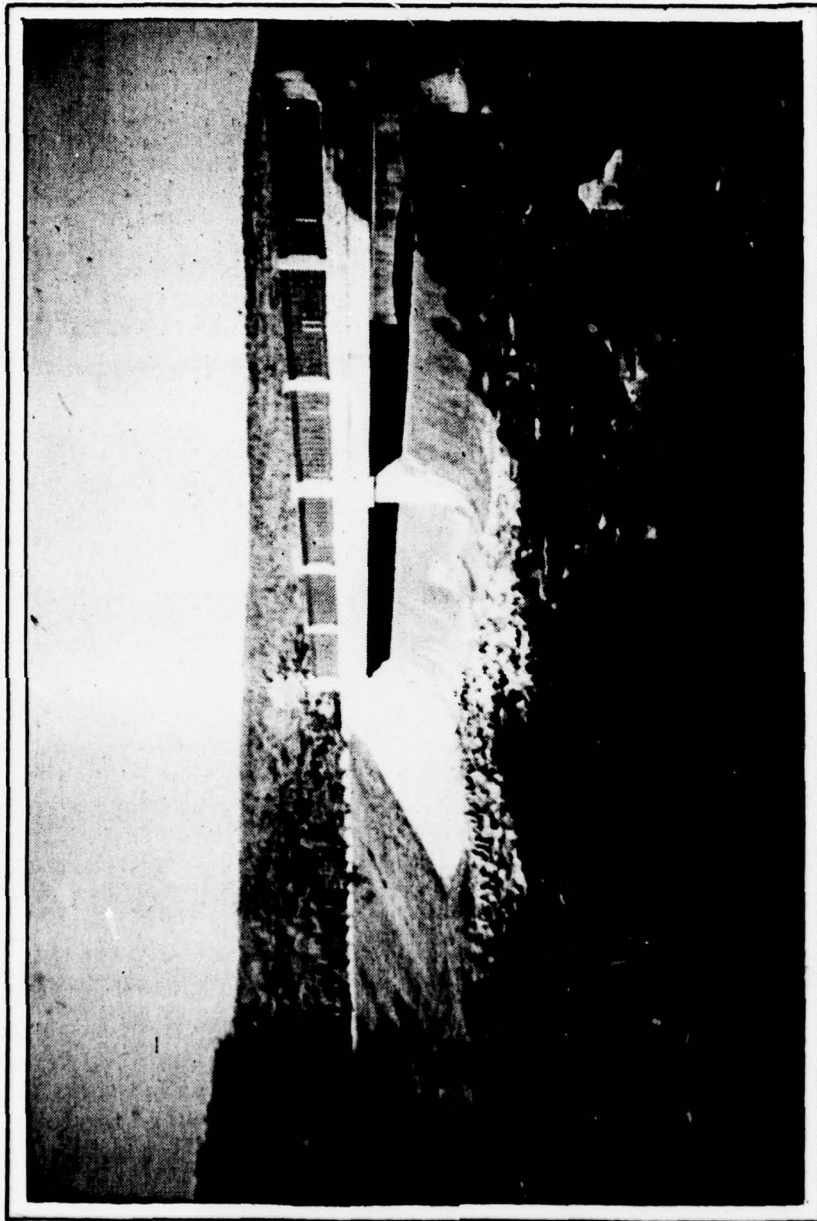
INTAKE TOWER

PHOTOGRAPH NO. 1



VIEW OF OUTLET SYSTEM AT DOWNSTREAM  
TOE. THE OUTLET PIPE DISCHARGES BELOW  
THE WATER LEVEL OF THE LOWER RESERVOIR  
(DOCTOR MAINE POND).





OVERVIEW OF SPILLWAY AND DISCHARGE  
CHANNEL.

PHOTOGRAPH NO. 3



UPSTREAM VIEW OF SPILLWAY. NOTE THE  
DUMPED GRAVEL IN THE SPILLWAY APPROACH  
CHANNEL.

PHOTOGRAPH NO. 4



VIEW OF SPILLWAY DISCHARGE CHANNEL.

PHOTOGRAPH NO. 5





VIEW OF UPSTREAM SLOPE LOOKING TOWARDS  
LEFT ABUTMENT.



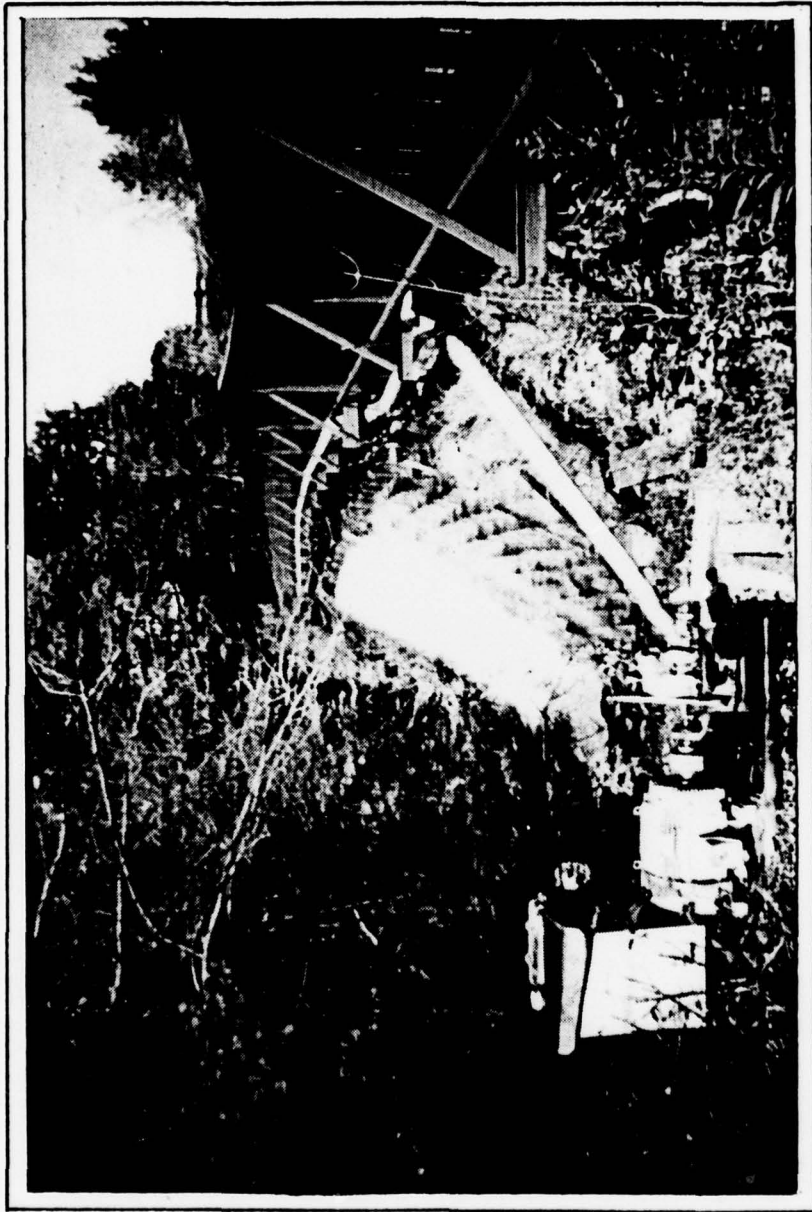
VIEW OF DOWNSTREAM SLOPE LOOKING  
TOWARDS RIGHT ABUTMENT.



VIEW OF UPSTREAM SIDE OF NO. 10  
DAM.

PHOTOGRAPH NO. 8





VIEW OF DOWNSTREAM SIDE OF NO. 10  
DAM.

PHOTOGRAPH NO. 9



TYPICAL CHANNEL CONDITIONS BETWEEN  
DOCTOR MAINE DAM AND NO. 10 DAM.

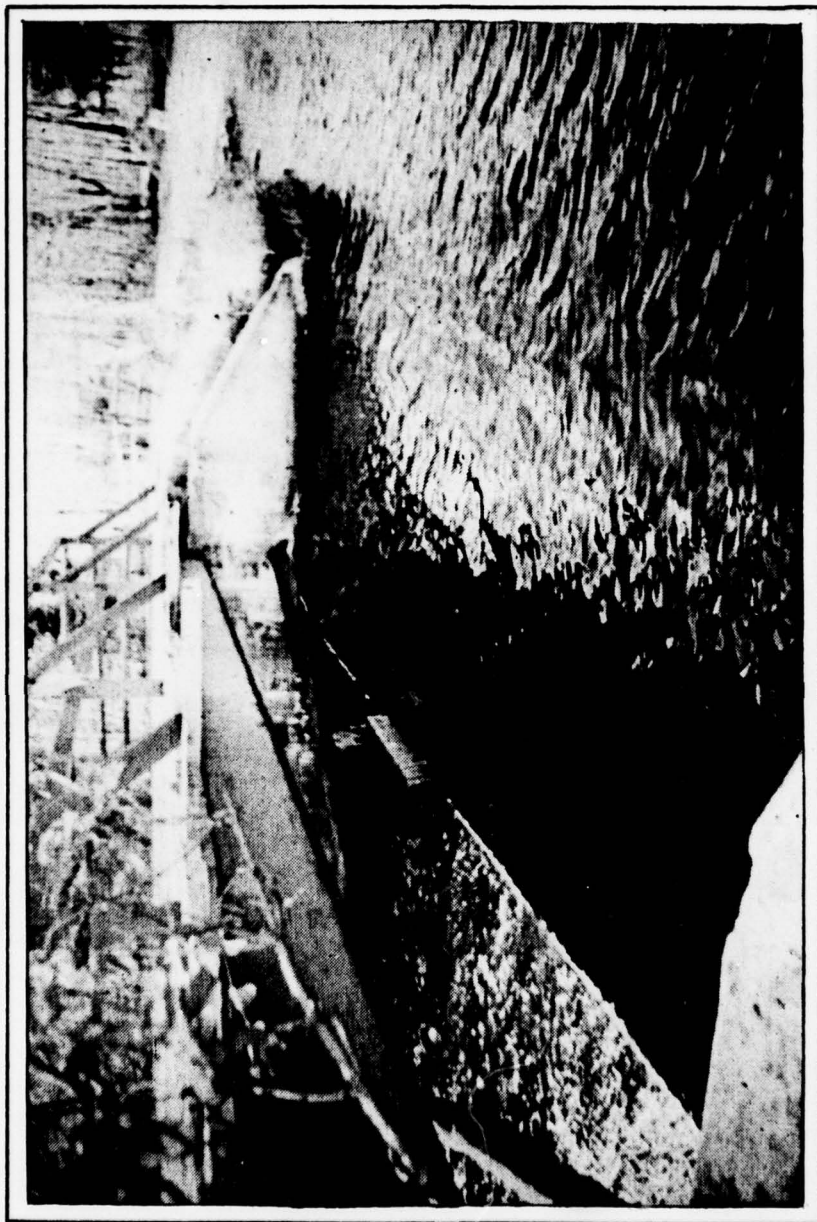
PHOTOGRAPH NO. 10



TYPICAL CHANNEL CONDITIONS BELOW  
NO. 10 DAM AND ABOVE SCS DAM PA 463.

PHOTOGRAPH NO. 11

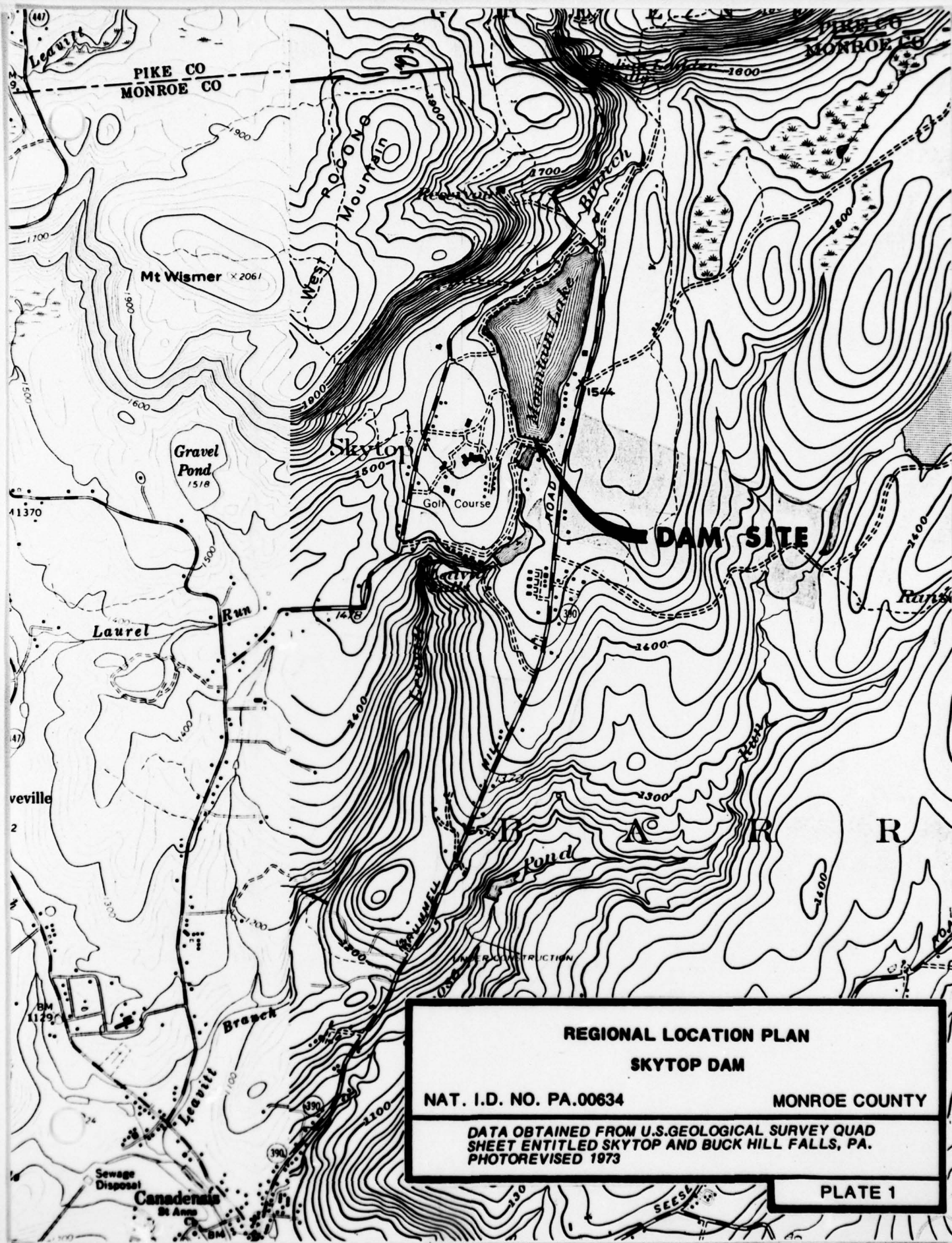




SPILLWAY OF LAKE IN THE CLOUDS.  
THE DAM AND RESERVOIR ARE  
LOCATED APPROXIMATELY 2.5 MILES  
UPSTREAM OF SKYTOP RESERVOIR.

**APPENDIX**

**E**



**REGIONAL LOCATION PLAN**

**SKYTOP DAM**

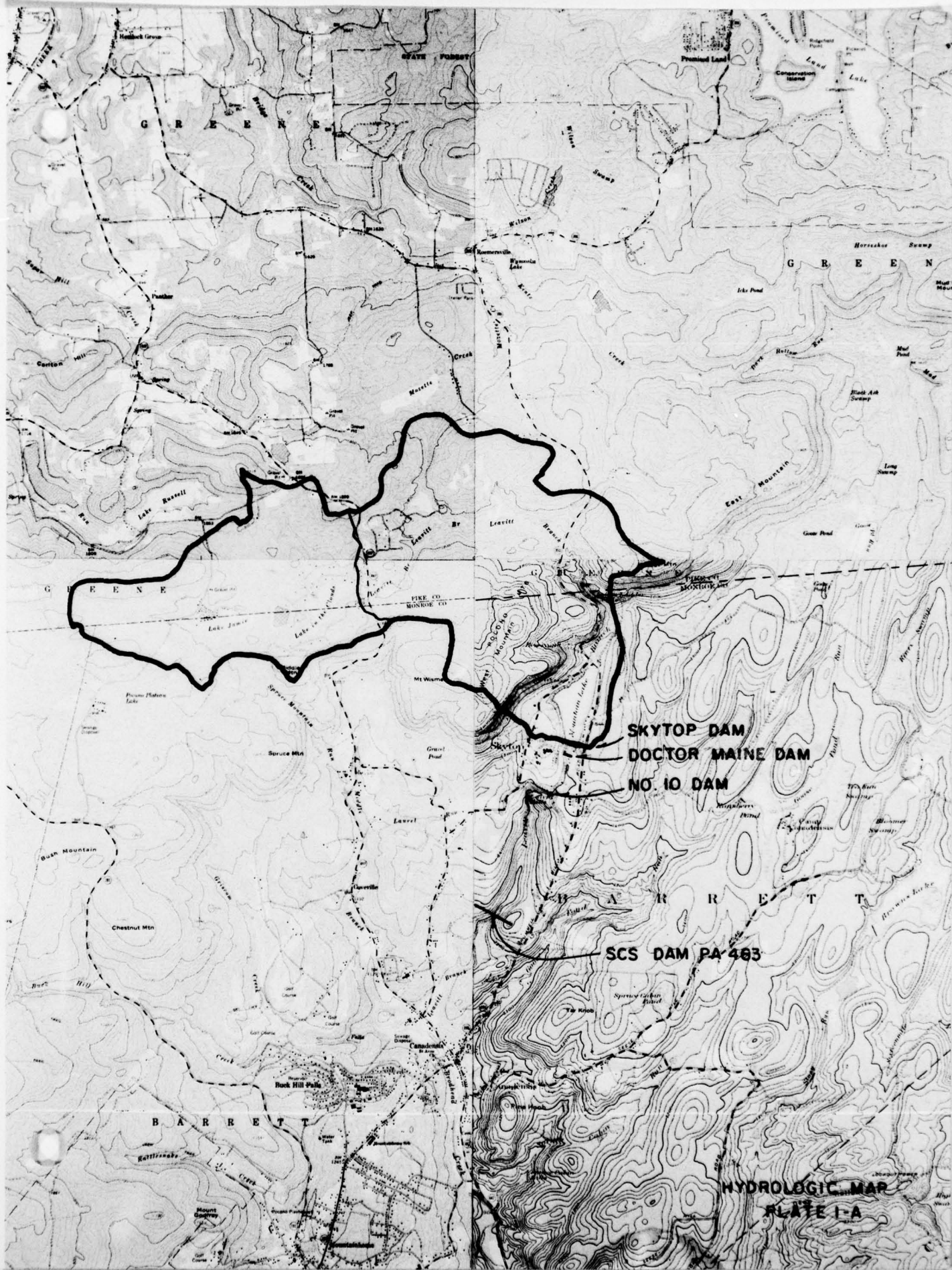
NAT. I.D. NO. PA.00634

MONROE COUNTY

DATA OBTAINED FROM U.S.GEOLOGICAL SURVEY QUAD  
SHEET ENTITLED SKYTOP AND BUCK HILL FALLS, PA.  
PHOTOREVISED 1973

PLATE 1

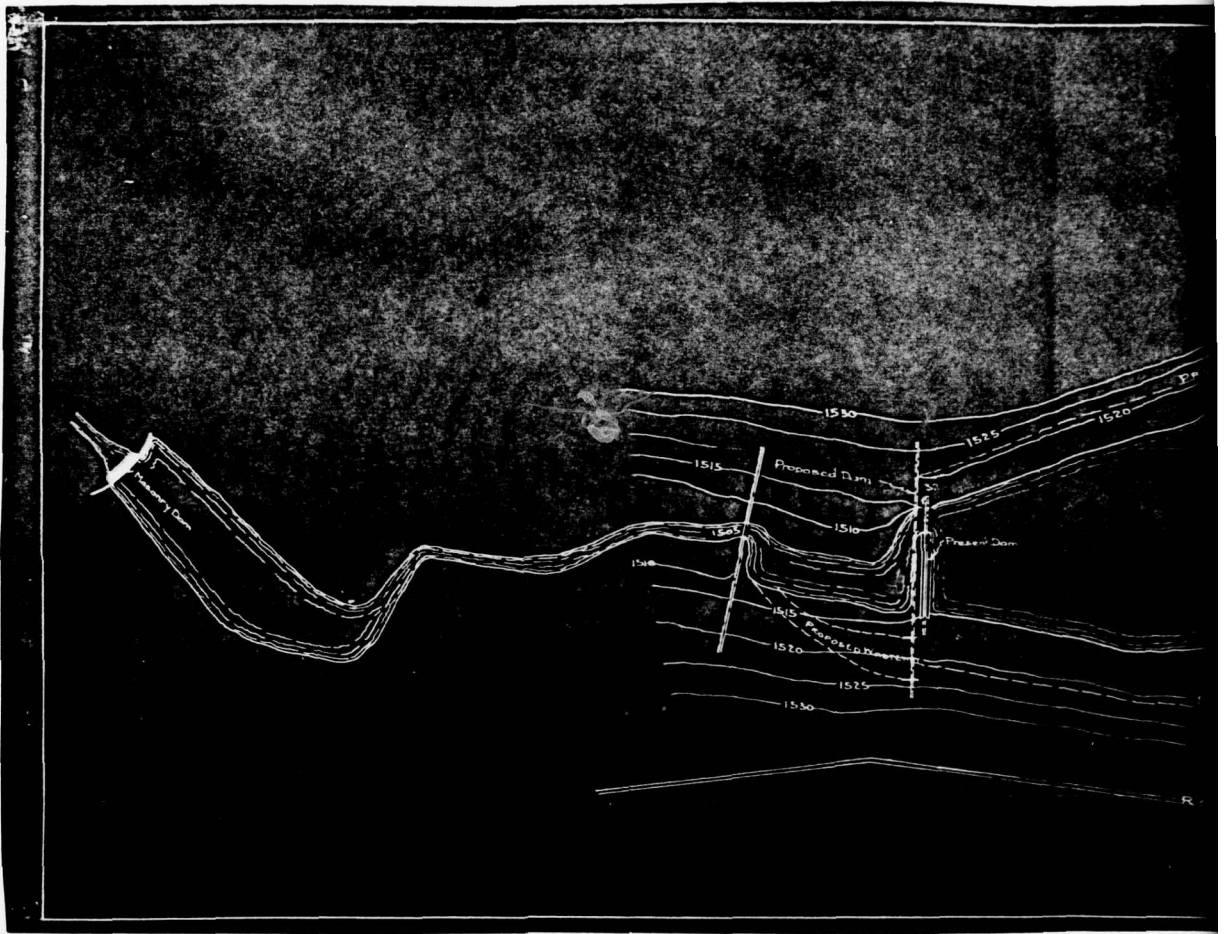


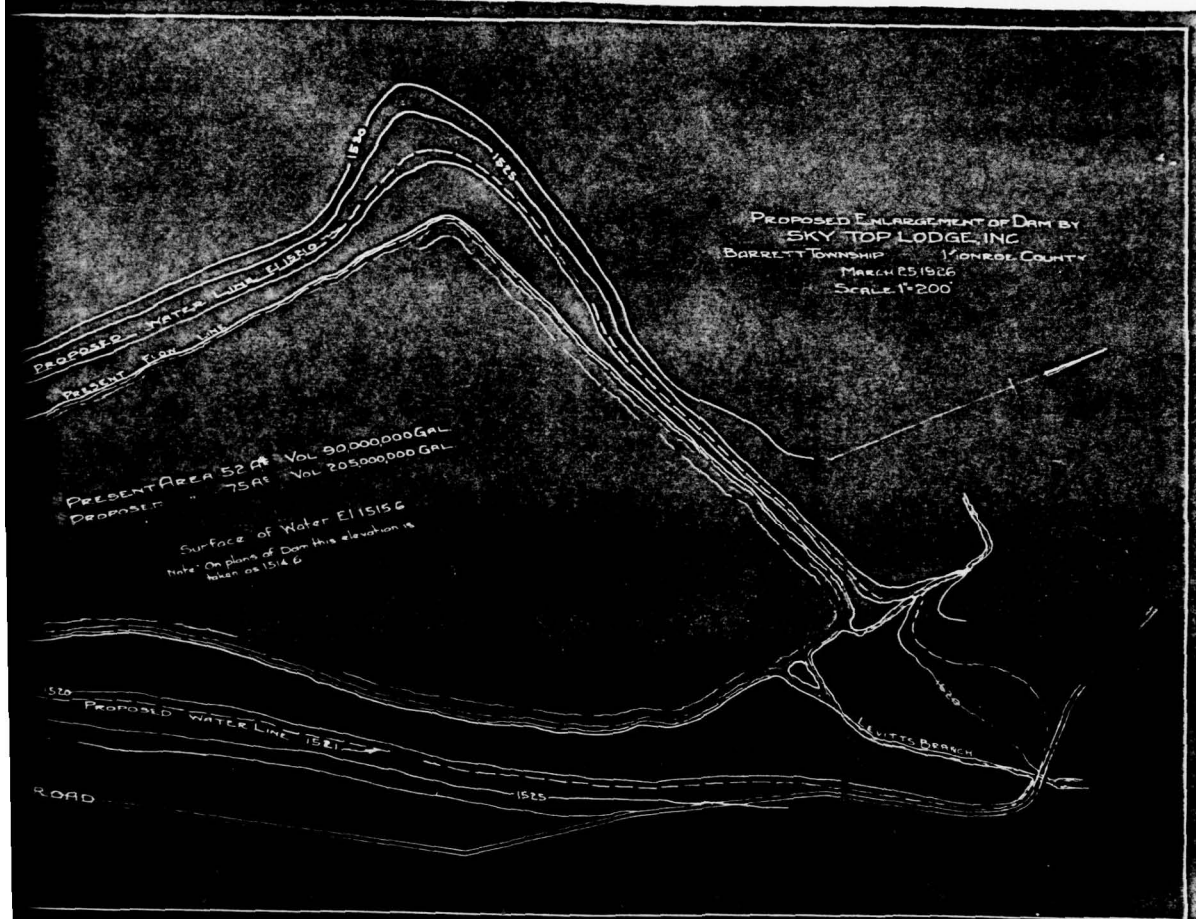


SKYTOP DAM  
DOCTOR MAINE DAM  
NO. 10 DAM

SCS DAM PA 463

HYDROLOGIC MAP  
PLATE I-A





PLAN OF DAM AND RESERVOIR  
 SKYTOP DAM

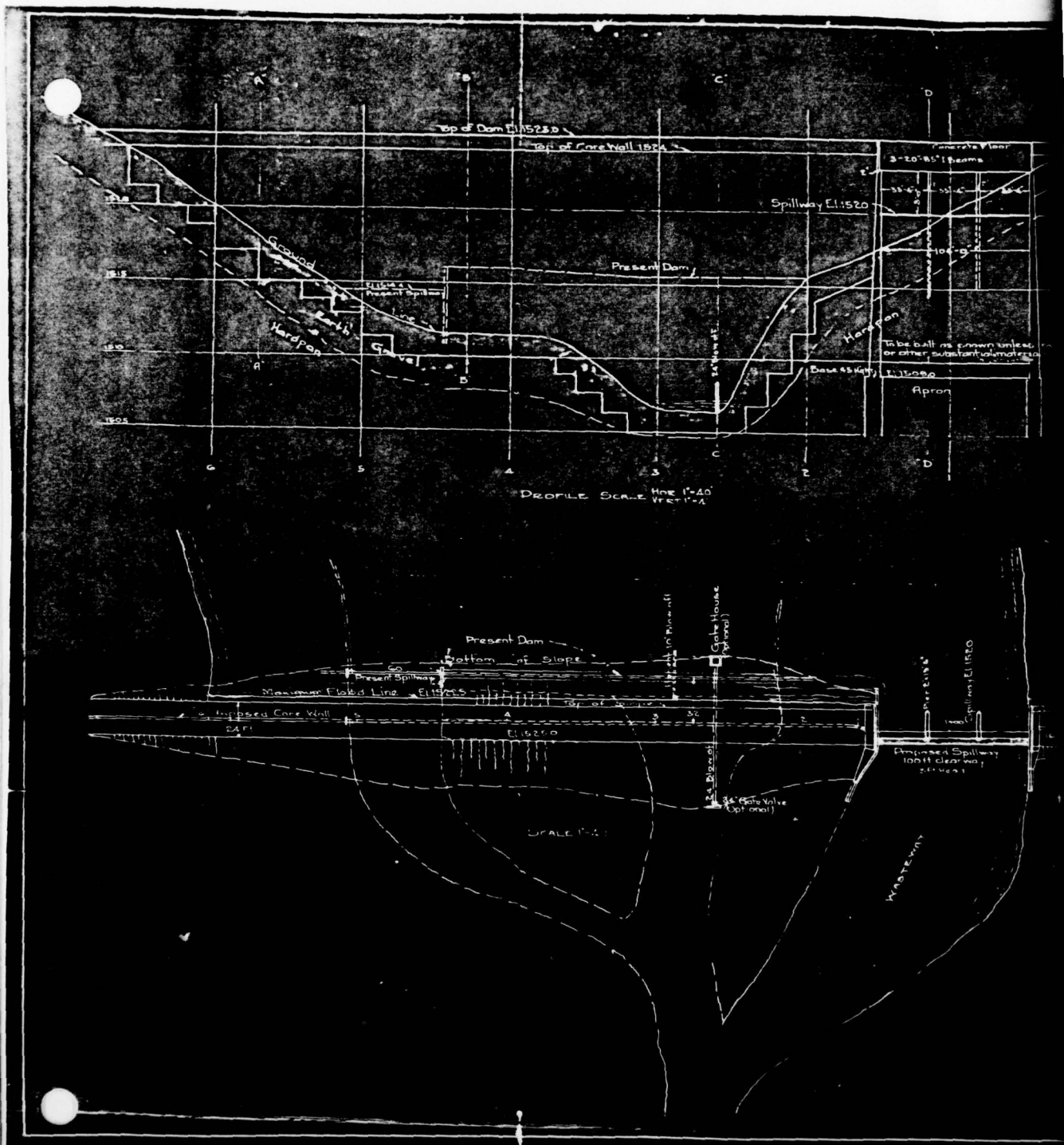
NAT. ID NO. PA.00634

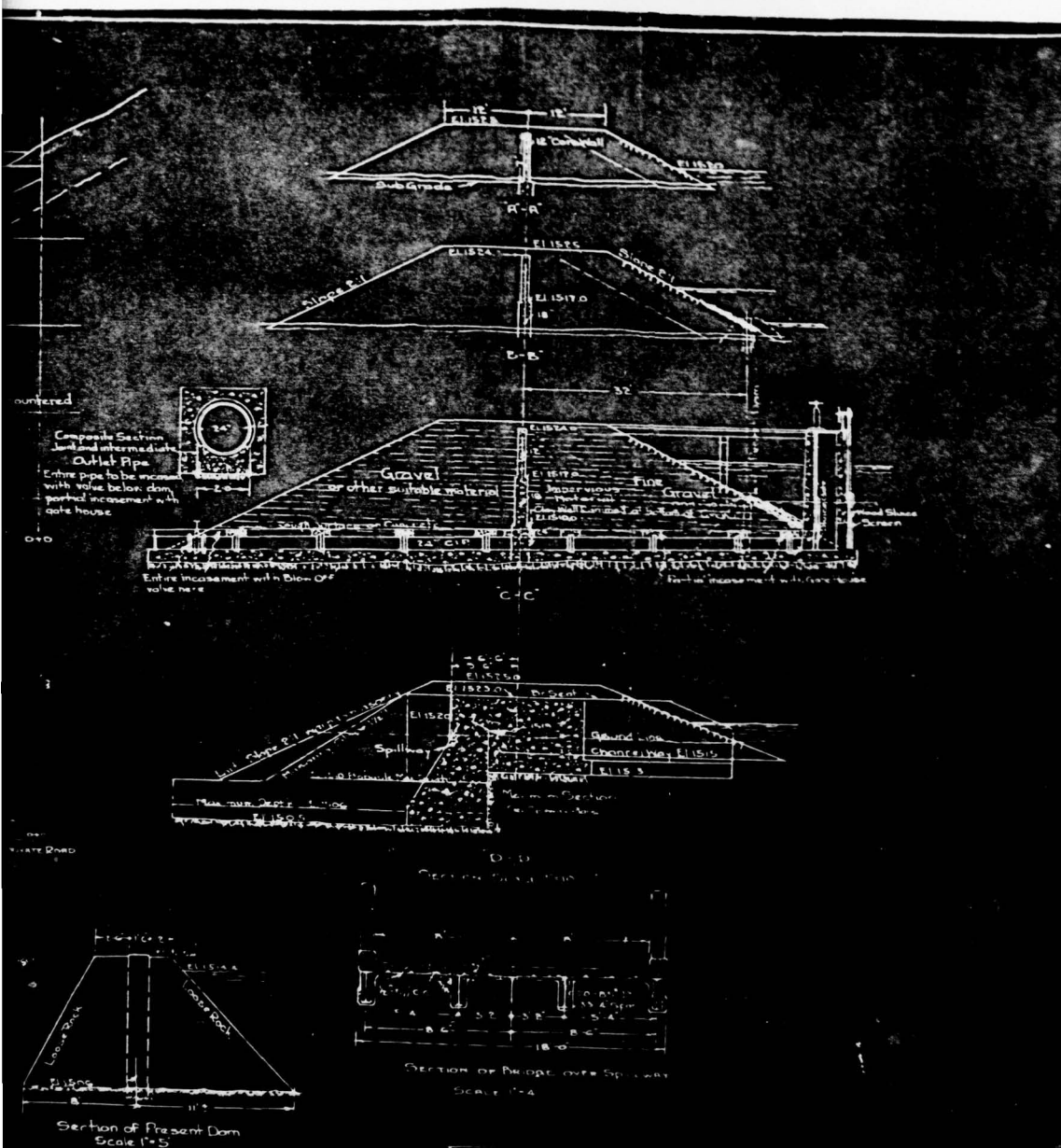
MONROE COUNTY

DATA OBTAINED FROM SKYTOP LODGE, INC. BARRETT  
 TWP., MONROE COUNTY, DATED MARCH 25, 1926

PLATE 2







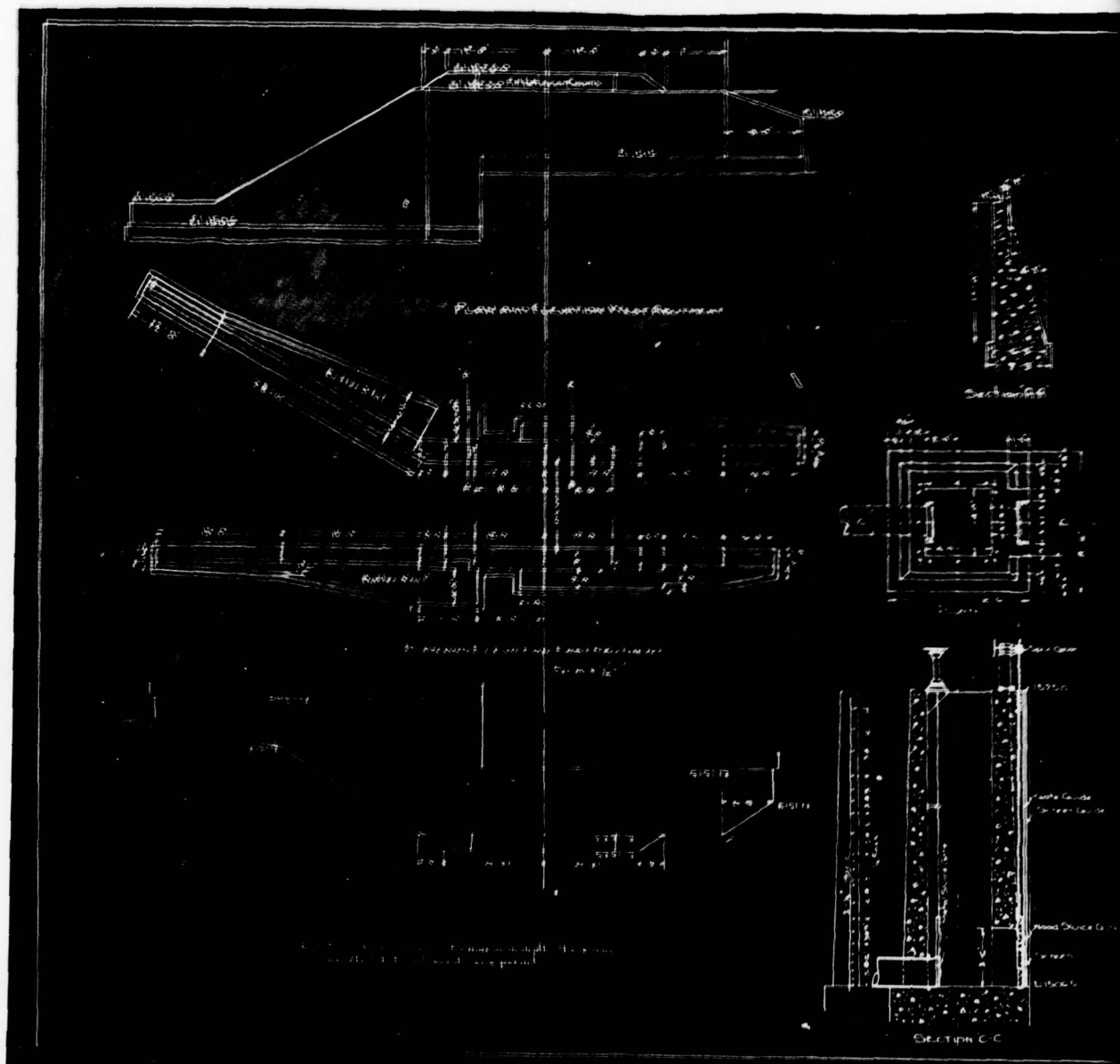
**PLAN AND CROSS-SECTION OF DAM  
SKYTOP DAM**

NAT. ID NO. PA.00634

MONROE COUNTY

DATA OBTAINED FROM SKYTOP LODGE, INC. BARRETT  
TWP., MONROE COUNTY, DATED MARCH 25, 1927

PLATE 3





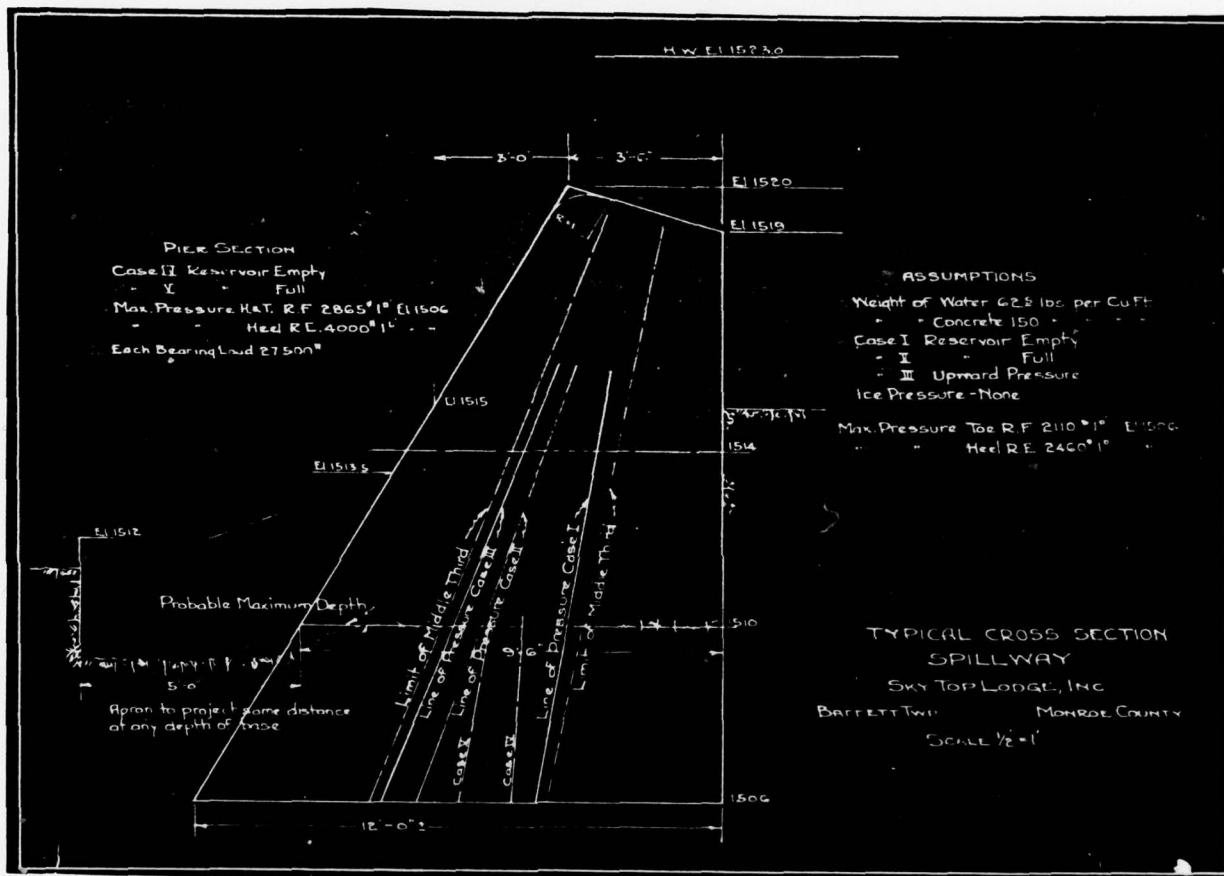
## PLAN AND PROFILE - ABUTMENTS AND GATE HOUSE

NAT. ID NO. PA.00634

**MONROE COUNTY**

DATA OBTAINED FROM SKYTOP LODGE, INC. BARRETT  
TWP., MONROE COUNTY, DATED MARCH 27, 1927

PLATE 4



## SPILLWAY AND STABILITY ANALYSIS

### SKYTOP DAM

NAT. ID NO. PA.00634

MONROE COUNTY

DATA OBTAINED FROM SKYTOP LODGE, INC. BARRETT TWP., MONROE COUNTY, DATED MARCH 25, 1927

PLATE 5

**APPENDIX**

**F**



## SITE GEOLOGY

### SKYTOP DAM

Skytop Dam is located in the Glaciated Low Plateaus Section of the Appalachian Plateaus Physiographic Province adjacent to the Pocono Plateau Section. As shown in Plate F-1, the dam site and surrounding region, as is much of northeastern Pennsylvania, is underlain by the Upper Devonian age Catskill Formation. Often, sections of these areas are overlain by a mantle of Wisconsin age glacial drift.

The dam is constructed upon this glacial drift which infills the valley containing Leavitt Branch Creek. No bedrock exposures were observed in the immediate area of the dam during the field inspection. Approximately 2,100 feet downstream from the dam northerly dipping (upstream) rock exposures were found. Foundation seepage would mostly be attributed to the glacial deposits as opposed to the structure of the underlying sandstone and siltstone bedrock.

